A CHILTON PUBLICATION

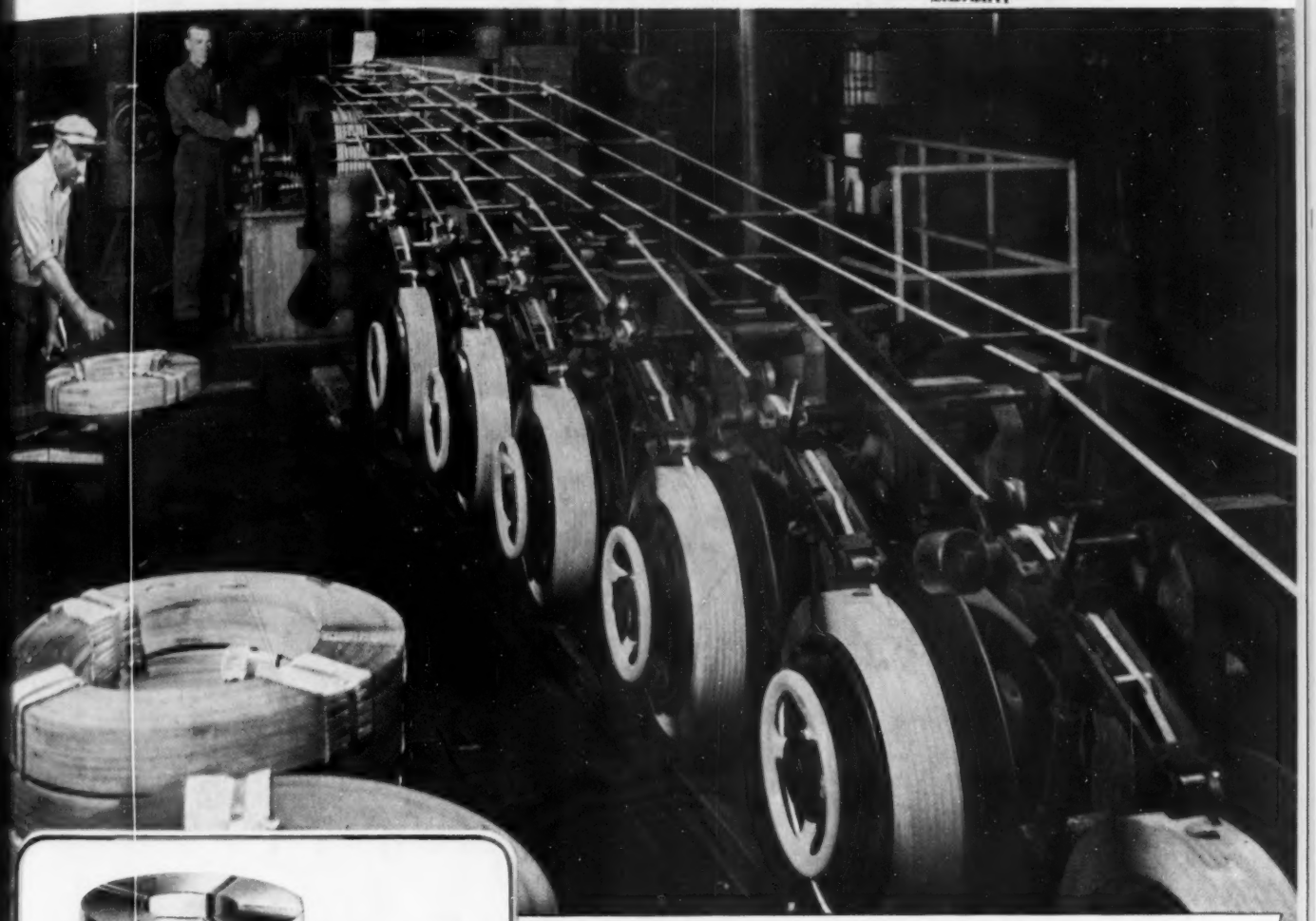
The Iron Age

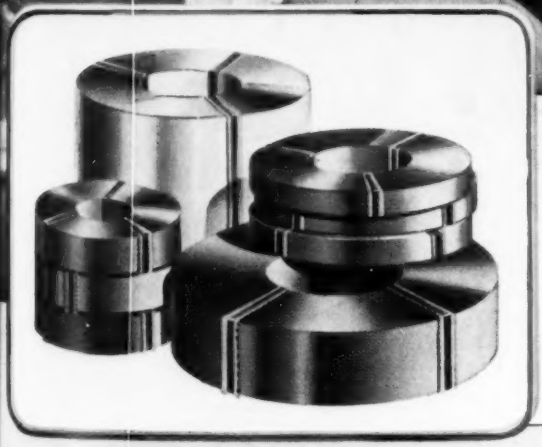
THE NATIONAL METALWORKING WEEKLY

July 29, 1954

Metal Cleaning and Finishing

See page 79





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The Iron Age

Vol. 174, No. 5, July 29, 1954

★Starred items are digested at the right.

The Iron Age, published every Thursday by CHILTON CO. (INC.), Chestnut & 56th Sts., Philadelphia 39, Pa. Entered as second class matter, Nov. 8, 1932, at the Post Office at Philadelphia under the act of March 3, 1879. $5 for 1 year, $8 for 2 years in United States, its territories and Canada; other Western Hemisphere Countries, $15, other Foreign Countries, $25 per year. Single copies, 50¢. Annual Review Issue, $2.00. Cables: "Ironage." N. Y.

Address mail to 100 E. 42 St., N. Y. 17, N. Y.

Digest of the Week

NEWS DEVELOPMENTS

STEEL ABSORBS $70 MILLION FREIGHT COSTS — P.
Freight absorption may cost steel producers as much as $70 million in 1954. It is costing steelmakers between 75¢ and $1 per ton. This is an estimate based on experience of mills in scattered locations. Eastern and Midwest mills appear to be getting off easier than mills in the Pittsburgh district.

WARY ON HIGH-DENSITY IRON POWDER — P.
Despite recent flurry of enthusiastic inquiries, no real boom is in the making for high-density iron powder. Estimated maximum potential production capacity for high quality electrolytic iron powder is about 100 tons monthly—but actual use is only 10 to 25 tons per month. Performance reports are good.

C&O TRAFFIC ADVERTISEMENTS RING BELL — P.
National advertising campaign stressing the importance of traffic managers in industrial distribution has met with rousing success. Campaign follows the theory that you get further by helping your customers than by rapping the competition. Letters to C&O show business is being spurred to action.

SEE EASING OF AUTO INVENTORY PROBLEM — P.
Auto industry is finally winning out in its crucial inventory battle. There won't be a sudden surge of automotive strength but industry will be in good shape for '55. Who will benefit from easier depreciation policies in tax reform bill? Political tide swinging back to Republicans.

WILDCAT WALKOUT CRIPPLES DODGE PLANTS — P.
Three men's grievance over a work procedure change causes a landslide of layoffs. Pickets, production bottlenecks idle 45,000. But strike settlement was achieved. Industry sales rate climbs for new, used and imported trucks and autos. U. S. total auto sales passes 7 million mark for '54.

BUSINESS PICKUP WILL HELP IKE IN FALL — P.
Substantial evidence of underlying strength despite this summer's seasonally slow business points to a sturdy pickup in orders soon after Labor Day. Steel, autos and appliances are all tabbed for fair shares in the coming rise. And it's expected to boost Mr. Eisenhower's cause at the polls in November.

in Metalworking

MARKETS & PRICES

WAREHOUSE BUSINESS STARTS REBOUND — P. 53
Steel warehouses have passed the bottom on sales and volume is starting to edge up again. Improvement is noted both in shipments from warehouses to their customers and from mills to warehouses. Reversal is significant, since warehouses are good economic indicators. Climb will resume after July vacations.

APPLIANCE SALES TOPPING PREDICTIONS — P. 55
Volume of appliance industry this year won't quite hit 1953's—which set record despite second half slump. Major producers optimistic, some saying current sales top like '53 period. Inventories reported low by producers, dealers, jobbers. See second half boom—but smaller firms may not feel it.

NEW TOOL ORDERS TAKE SUDDEN JUMP — P. 77
New orders for machine tools in June snapped the down-trend that began last September and pushed the industry's index figure up to 186.8. This is the highest point the index has reached since last October when new order index stood at 198.7. June is 47.3 index points higher than the May index.

STEEL BUSINESS BETTER THAN SOME THINK — P. 169
Steel business is a lot better than some of the pessimists think. Despite gloomy predictions of some, most producers will show a relatively good profit during first half of 1954. And most steel people are convinced they are past the worst of their slump. This year will go on the credit side of the ledger.

STEEL PRODUCERS STILL EXPECT PICKUP — P. 171
While there is little to cheer about at the moment, steel sales executives are convinced the worst is over. They're still betting on that long-predicted pickup in September. Reports of upturn in warehouse business back their view. Galvanized sheets, oil country goods, structurals still lead markets.

NONFERROUS MARKETS IN MIDSUMMER LULL — P. 172
Major nonferrous metals markets entered this week relatively steady, awaiting further developments. First to come will be the aluminum wage settlement with a price increase expected to follow. Ingot makers have already boosted prices on some secondary alloy grades. Lead and zinc are steady, producers optimistic.

Feature Issue

Metal Cleaning and Finishing Handbook

Metal finishing's growing importance to the metalworking industry has resulted in the development of many new finishing and cleaning methods. The Iron Age's new Handbook of Metal Cleaning and Finishing will aid you in selecting the right process for your product. Following are some of the subjects covered in the handbook, which begins on p. 78.

SPOT TEST IDENTIFICATION OF SURFACES — P. F-2
Methods of spot testing for Aluminum, Monel, white brass, silver, stainless steel, cadmium, copper, gold, chromium, platinum, rhodium, nickel, etc.

TYPES OF PHOSPHATE SURFACE TREATMENTS — P. F-3
What phosphates to use for paint bonding, rust proofing, cleaning and phosphating, etc.; with methods of application, accelerators and inhibitors.

CHEMICAL CONVERSION COATINGS TABLE — P. F-6
Latest government specifications, including official title, type of coating, test requirements and uses.

CHLORINATED SOLVENTS: USES, PROPERTIES — P. F-11
Physical properties, stability and uses of chlorinated solvents. Tables cover seven chlorinated solvents.

TABLE OF TYPICAL COATING PROPERTIES — P. F-13
Lists coatings such as nitrocellulose lacquers, alkyds, phenol formaldehyde, vinyls, etc. Indicates their resistance to sunlight, heat, weak acids.

SPECIFICATIONS OF RUST PREVENTIVES — P. F-19
Government and other specifications with description of film, physical properties, etc., and list of suppliers.

PLATED AND SPRAYED METALLIC COATINGS — P. F-21
Latest government specs on plated and sprayed coatings. Outlines coating character, thickness, finish, etc.

THE SPECIFICATION PLATING OF METALS — P. F-28
Estimated times to produce given deposit thicknesses. Also, 9 ways to check thickness of deposits.

WANT EXTRA COPIES?

A limited number of extra copies of this special handbook will be available upon request to Readers' Service Dept., THE IRON AGE, 100 E. 42nd St., New York 17, N. Y.

THE IRON AGE

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Indexed in the Industrial Arts Index and the Engineering Index.

Indochina Hangover

FRANCE, Great Britain and the U. S. have tossed 12 million Vietnamese to the Reds. They have signed or "respect" armistice terms which may lose 10 million more in South Vietnam to the Reds. Also these terms prevent Laos and Cambodia from joining a southeastern Asia protective association.

Platitudes from Mr. Dulles or Gen. Walter Bedell Smith don't hide the complete victory for the Communists in Indochina. Current public statements can't change the fact that the world is still in more danger than before and that we don't seem capable of doing much about it.

Facts about the international crisis are not being told to Americans by their government. Administration advisors may be afraid of elections or of congressmen up for election.

Congressmen do not necessarily reflect the feelings of the people. Peoples of all nations usually have been ahead of their leaders in the cause of freedom. When potential leaders find this out they become leaders—and not until then.

The average person—whose support is needed to keep the Reds from overrunning the world—doesn't know that British and Americans are making little headway on drawing a line over which the Reds must not cross in Southeast Asia. Nor does he know that France stands a chance of losing Tunisia and Morocco to nationalist groups supported or infiltrated by Communists.

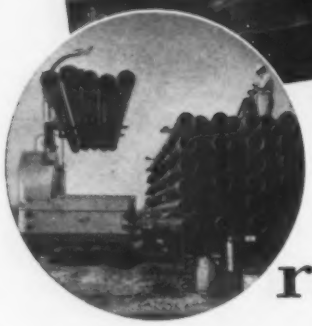
It is not generally an accepted fact that in view of the serious global situation this is no time to cut the defense expenditures. Nor is it known that privately—among many government people—there has been a quick awakening of our danger and another "look" is being taken at our defenses. Some of the Joint Chiefs of Staff are being frustrated by political advisors whose days may be numbered if we are to make up for lost time.

Joe Doakes is being given the idea that "world tensions" are being relaxed. Just the opposite is true. The Reds now find themselves in a position to get bigger and better grabs without war. The whole of Indochina is now threatened—by infiltration, deceit and so-called truce terms which won't mean a thing to the Reds.

The Communist world gets bigger and bigger and stronger and stronger. The free world gets smaller and smaller and weaker and weaker. All of us must face this fact soon.

Tom Campbell

Editor



Traveloader® replaces 3 trucks and releases 6 men for other work

● A Traveloader is used by Kyle-Taylor Lumber Company, Berwick, La., to transport pipe from river dock to storage. It has replaced two pipe trailers and a gin-pole truck formerly used on this job, reduced man-power required from 15 to 9 and made time savings of about 70%.

This company, serving oil producers, receives pipe in barges at the river dock. A truck crane unloads and places the pipe on the dock. The Traveloader picks it up five lengths at a time, transports it to the storage yard, and stacks it neatly on racks for further disposition.

Time studies reveal the speed with which Traveloader works. Loading time at dock averages 35 seconds. Hauling to storage, stacking and returning to dock (round trip .55 miles) averages 3 minutes 8 seconds. The stacking part of this operation takes only 24 seconds! As a result the crane at the dock never has to wait for the Traveloader.

Since the company operates 24 hours, 7 days per week, the cost savings are substantial. Moreover, 6 more workers were made available without increasing payroll, and two less mechanized units require maintenance. "This machine is by far the finest that I have seen for handling pipe. It has doubled our capacity with less labor," says Mr. J. E. Kyle, Jr., Vice President.

Write for Bulletin 1360. It completely describes the remarkable TRAVELOADER that carries like a straddle truck, delivers like a road truck, and stacks like a fork truck. The Baker-Raulang Company, 1227 West 80th Street, Cleveland 2, Ohio.

Baker®
industrial trucks

Dear Editor:

Letters from readers

Faster Fabrication

Sir:

Have just finished reading the fine article on feeding coiled strip in punch press operations by John E. Hyler in the June 10 issue.

Due to the fact that the majority of work in our plant is sheet metal stamping, I was very interested in some of the devices mentioned. Of particular interest was the universal feed operated by hydraulic pressure illustrated on p. 120.

If it is possible, I would like to obtain more information on this type of feed. If you do not have this information perhaps you can let me know what company makes this item.

H. A. BRETZ
Chief Die Designer

Ternstedt Div.
General Motors Corp.
Detroit

For more details on this item contact Jaco Devices, 102 High St., Hingham, Mass.—Ed.

Precision Casting

Sir:

It would be appreciated if permission could be granted for us to reproduce the following article, as published in THE IRON AGE: "Cut Tool Costs, Simplify Design With Precision Casting" by S. Snorek, Feb. 11 issue.

The article, along with others written by our engineers, will be disseminated in limited quantities within the company for information only.

J. W. COURAGE
Information Dept.

Western Electric Co.
New York

Economic Squeeze

Sir:

Current comment in business magazines and newspapers to the effect that steel fabricators will probably absorb steel price increases is misleading and certainly devoid of sound economic fact. Those of us who use steel are hit twice; first by the increase in steel prices, and secondly by labor increases of our own due to the pattern set by steel. Since the customer of a steel fabricator pays the same extra to any of his steel mill sources, there seems to be no good reason why he shouldn't allow it to the fabricator.

E. J. CARLSON
President

Indiana Forge & Machine Co.
East Chicago, Ind.

You are certainly correct in your description of the economic squeeze that has been placed on fabricators by the steel price increases. We pointed this out in our story. However, the majority of fabricators interviewed by us said the tough competition would force them to absorb the higher costs—much as they dislike doing so.—Ed.

Cavitation

Sir:

We have read with interest the following which appears on p. 45 of the June 24 issue:

"A new method for selecting materials for pump and turbine water blades has resulted from recent cavitation studies. Cavitation resistance of metals is determined by the metal's ability to resist surface breakdown under the test."

It would be greatly appreciated if you would forward us further information along these lines or advise us where we may obtain literature concerning this subject.

R. J. THOMPSON
Pacific Zone Manager

West Coast Div.
Ampco Metal, Inc.
Burbank, Calif.

Further information may be obtained from Allis-Chalmers Mfg. Co., 864 S. 70th St., Milwaukee 1, Wis.—Ed.

New Foundry Coke

Sir:

On p. 57 of the July 15 issue we note in the last paragraph that a new foundry coke has recently been tested.

We are very much interested in this item and would greatly appreciate it if you could let us know who is producing this coke.

S. HOOT
Vice-President

Carson, Marshall & Co.
Philadelphia

The foundry coke is made by the Great Lakes Carbon Corp., 8210 Austin Ave., Morton Grove, Ill. A technical article on this subject will appear in our Aug. 5 issue.—Ed.

Refractory Cement

Sir:

Will you please send me further information regarding refractory cement for aluminum furnaces mentioned in the Newsfront page of your July 1 issue.

Particularly we would like to know where this is obtainable.

A. W. BASON

General Electric Co.
Bridgeport, Conn.

Further information may be obtained from Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N. Y.—Ed.

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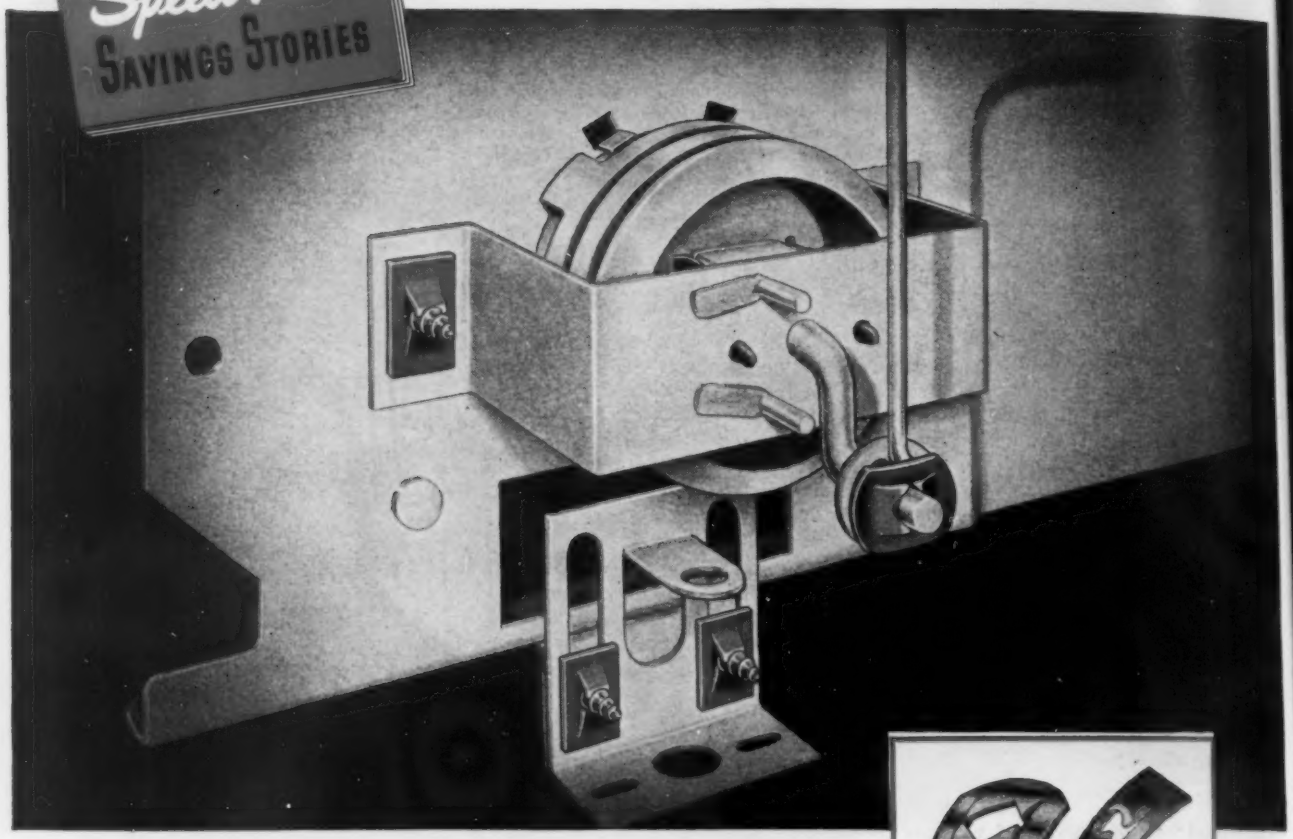
Speed Nut

SAVINGS STORIES

FASTEST THING IN FASTENINGS®



Chrysler Airtemp enjoys "refreshing" 40% cost saving!

New Casement Window Air Conditioner assembled at lower cost with 27 SPEED NUTS

Engineers of Chrysler's Airtemp Division, Dayton, Ohio, accepted many of the cost-saving recommendations in a Tinnerman Fastening Analysis Survey on their new Room Air Conditioner for casement windows. This led to the selection of 11 different types of SPEED NUTS to make a total of 27 attachments. The result: an estimated 40% saving in assembly costs over alternate fastening methods!

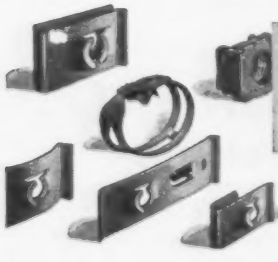
In addition to the Push-On and Flat Type SPEED NUTS used in the control panel assembly illustrated above, other SPEED NUT brand fasteners provide lightning-fast, corrosion-free, vibration-proof attachments on other sections of the new unit.

A Fastening Analysis of your product can lead to lower costs on current models, even greater savings on new or advanced designs. See your Tinnerman representative for complete details!

Push-on Speed Nut | Flat Type Speed Nut

SPEED NUT applications result in substantial savings in assembly time, cost of materials, and materials handling. For example, SPEED NUTS eliminate costly threaded inserts, make faster, easier attachments in blind locations, and permit greater design flexibility. A complete range of types and sizes available.

Write today for your copy of the new Tinnerman Fastening Analysis Service Bulletin Number 336: TINNERMAN PRODUCTS, INC., Box 6688, Dept. 12, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners, Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A., 7 rue Henri Barbusse, Levallois (Seine).



TINNERMAN Speed Nuts®

MORE THAN 8000 SHAPES AND SIZES

The Iron Age
FOUNDED 1855

THE IRON AGE Newsfront

MOTOR COMPETITIVE FREIGHT RATES ON IRON AND STEEL were a mistake, railroad officials believe. Not enough business has been gained to offset loss of revenue through lower rates.

HYDROGEN EMBRITTLEMENT IN TITANIUM ALLOYS, a major problem, stands in the way of wider acceptance of the metal for critical aircraft uses. One aircraft engine maker had to call back over 100 finished engines because of failure of titanium components through hydrogen embrittlement.

GREAT LAKES ORE SHIPPERS PREDICT the 1954 season will probably close on or before Nov. 1st. Early season end is anticipated because stockpiles have reached sizeable proportions despite a late start in May.

NEW WETTING AGENTS used in a recently developed water-soluble coolant concentrate are claimed to be more effective in reducing cutting temperatures. The concentrate is sulphur-free and odorless. Low surface tension of the wetting agents is said to aid coolant flow while decreasing heat build-up in tools.

NEW FRONT END SUSPENSIONS will be major engineering change in several of the 1955 model cars. The new designs will result in sweeping changes in metal processing and also in the type of materials specified.

THE HOTLY COMPETITIVE SALES RACE between Ford and Chevrolet will continue. Ford is asking suppliers if releases can be increased by 20 pct during the next 6 weeks. While Ford production is booming here, however, Ford-Canada sales have slumped.

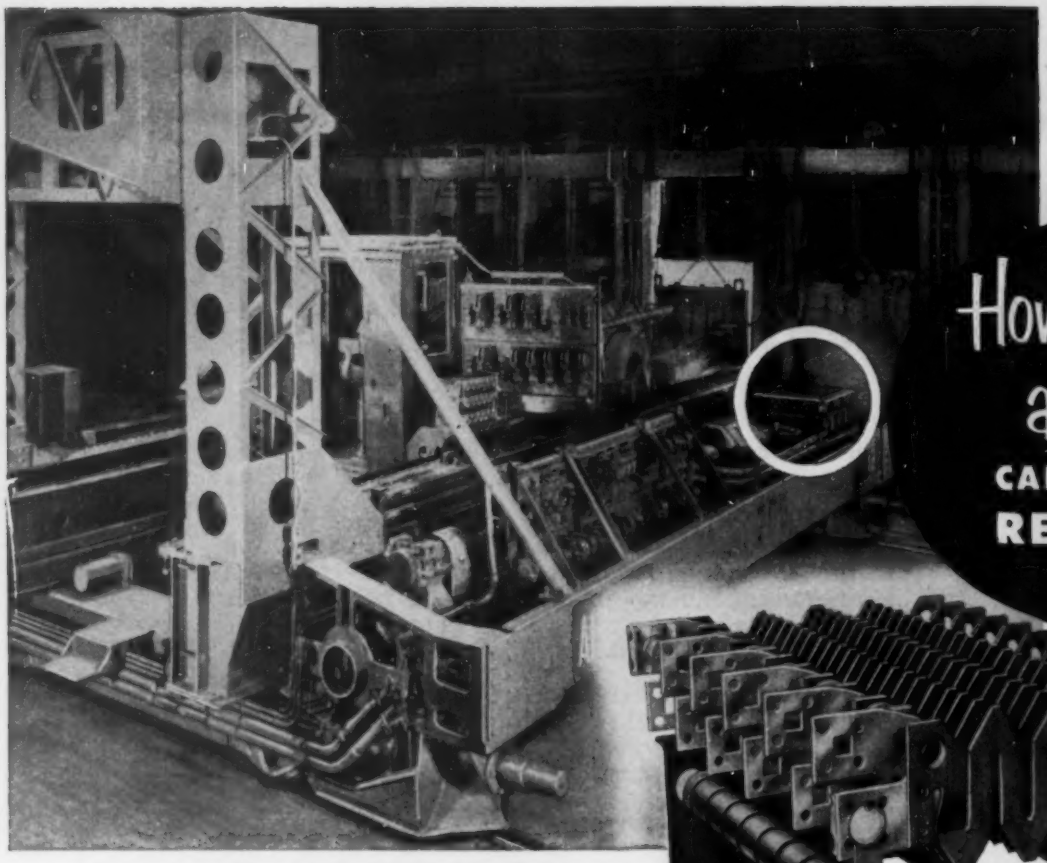
GREATER PRODUCTION can be achieved on hot jobs by providing air conditioned rest rooms for workers' use between work periods. Recent scientific studies of the effects of temperature and humidity on heart action point up advantages of ventilation and temperature control systems in manufacturing plants.

HOT EXTRUSION OF HIGH SPEED STEEL BARS AND SHAPES has been tried experimentally by a tool steel maker with an eye toward cutting rolling or forging costs in the manufacture of small, special lots. Characteristics of the extruded alloys are now being compared with known values for conventional rolled and forged materials.

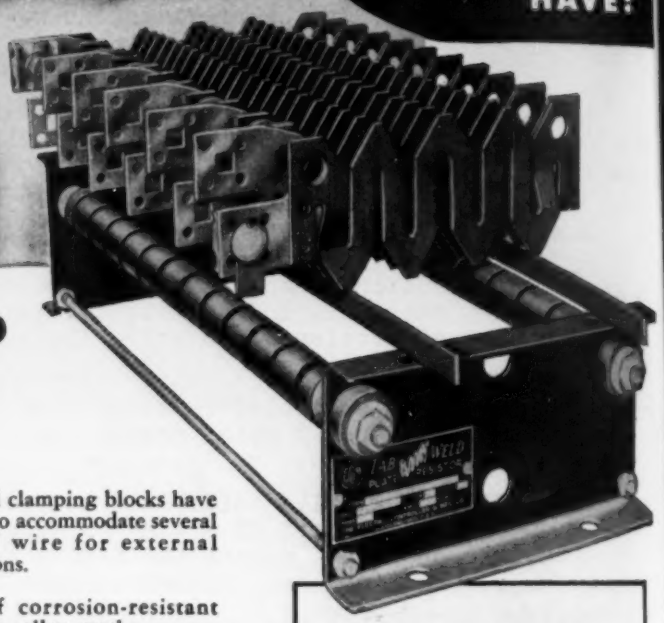
GREATER RELIABILITY in turbine and reduction gear operation has resulted, from a recent use of thermocouples. The instruments provide more accurate measurement of temperatures of bearing lubrication oil discharge from propulsion steam turbines.

A SLIDING VANE AIR COMPRESSOR, little bigger than a typewriter but with an output of 120 cfm at 120 psi, will soon be in production. Two contoured compression cylinders and a single concentric shaft are used. Result: High output at relatively low rotating speeds. Vanes are of oil-impregnated iron-copper alloy.

TREND TOWARD SHORTER HEAT CYCLES in steel foundries had demanded a more continuous supply of metal. One plant is producing about 40 tons of tractor castings per day by continuous molding and pouring. An improvement program now aims at 40 man-hours per ton for small steel castings.



How many advantages CAN A RESISTOR HAVE!



ONLY EC&M TAB-WELD PLATE RESISTORS HAVE ALL THESE FEATURES!

1. Spot-welding of resistor ends, offset to bring adjacent grid eyes into intimate contact, results in permanent current-carrying path throughout the section.
2. No burning at grid eyes.
3. No periodic tightening of clamping nuts.
4. Terminal plates welded to resistor tabs along one side of section. Small adjustments in resistance value easily effected because plates are closely spaced.
5. No burning at taps.
6. Negligible resistance change between cold and maximum working temperature.
7. Insulating spacers of high dielectric strength accurately molded to shape from noncarbonizing material which remains dimensionally stable.
8. Terminal clamping blocks have grooves to accommodate several sizes of wire for external connections.
9. Made of corrosion-resistant chromium alloy steel.
10. Nonbreakable.
11. Double insulation to ground.
12. All standard sections same length, width and height.
13. Standard mill sections built with same size resistors per section.
14. Separate nuts on supporting rods clamp grid-stack independently of end-frame clamping. Accurate mounting-hole dimensions maintained regardless of variation of grid-stack length.

SHUTDOWN AVOIDED! Recently in one installation, a swinging overhead-crane load bumped resistors on charging machine and smashed end-frames and broke several spacers of grid assembly. *Shutdown was avoided* because current-carrying path of EC&M TAB-WELD Resistors remained intact and permitted charging of furnaces to continue. Later when down-time was available, section was replaced and returned to repair shop for new spacers and end-frames. This is another example of the durability of EC&M TAB-WELD Resistors.

Write today for illustrated Bulletin No. 942-B.

1806

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the Iron Age
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News Section

STEEL: Absorb $70 Million Freight Costs

Mills estimate freight absorption costs them 75¢-$1 per ton . . . Could total $70 million in '54 . . . Pittsburgh steelmakers hardest hit —By J. B. Delaney.

Freight absorption may cost steel producers as much as $70 million in 1954. It is costing steelmakers between 75¢ and $1 per ton. This is a rough estimate based on the experience of mills in scattered locations. A producer among the top five companies in the industry says absorption has cost an average of slightly more than $1 per ton in first 6 months of this year. And it may cost steel producers as much as $70 million in 1954.

Reports vary, company-to-company. Eastern and Midwest mills appear to be getting off easier than mills in the Pittsburgh district. One midwestern producer claims freight absorption costs so little that it is insignificant.

Competitive Rail Rates Help

Tending to reduce the average cost for the industry are these factors: (1) Some products are in such strong demand that absorption is limited or non-existent, and (2) proximity of some mills to their principal customers. Higher prices in the East and in Detroit on certain products also mean that much less absorption for other producers who want to remain in those markets.

Also helpful was the action of railroads in establishing motor-competitive freight rates, enabling Pittsburgh mills, for instance, to deliver into the desirable Detroit market and other consuming centers for dollars less than under the old rate schedule.

Products still in good demand and on which very little absorption is necessary include structurals, light plates, galvanized sheets, floor plates, and oil country goods. Everything else is competitive enough to make absorption of freight charges a necessity if the producer knows that a good customer is at stake.

"Phantom Freight" Was Worse

In one basic respect, the mills are facing the problem of freight costs in a uniform way: They will meet it where necessary to offset competition. But beyond that, the approach varies. Some producers have set a limit on the amount of freight charges they will absorb. Others will absorb more—or less—depending on importance of the customer involved and the profitability of the product.

In relation to the selling price of steel, freight absorption today is nowhere near the problem it was in the days of basing points and "phantom freight." One source recalls that over a 10-year period before basing points were abandoned, his company figured that freight was costing it $1 per ton. This would be equivalent to $1.25-$1.35 per ton today.

There is more selectivity today than in earlier years. For instance, a mill will pick up the tab on freight only in those sizes and shapes where it must meet competition: it will not absorb on a product that the customer cannot get elsewhere cheaper. In the old days a mill would charge the same price as his competitors even on sizes and shapes that only he could produce.

Freight absorption first became

IRON & STEEL: June Output By Districts

As Reported to the American Iron and Steel Institute

BLAST FURNACE —NET TONS DISTRICTS	Annual Capacity	PIG IRON June	PIG IRON Year to Date	FERROMANG. & SPIEGEL June	FERROMANG. & SPIEGEL Year to Date	TOTAL June	TOTAL Year to Date	Pct of Capacity June	Pct of Capacity Year to Date
Eastern	17,261,850	934,041	6,168,348	17,016	122,742	951,057	6,291,090	67.0	73.5
Pitts.-Yngstn.	29,501,270	1,610,129	x9,897,251	18,122	122,105	1,628,251	x10,019,356	67.1	68.5
Cleve.-Detroit	8,714,680	475,377	2,866,231			475,377	2,866,231	66.3	66.3
Chicago	16,371,250	1,027,541	6,298,942			1,027,541	6,298,942	76.3	77.5
Southern	6,273,080	391,265	2,371,824	5,383	47,611	396,648	2,419,435	76.8	77.7
Western	3,878,260	245,276	1,296,628			245,276	1,296,628	76.8	67.4
TOTAL	82,001,390	4,583,629	x28,899,224	40,521	292,458	4,724,150	x29,191,682	70.0	71.7

STEEL —NET TONS DISTRICTS	Annual Capacity	TOTAL STEEL* June	TOTAL STEEL* Year to Date	Pct of Capacity June	Pct of Capacity Year to Date	Index** June	Index** Year to Date	ALLOY STEEL June	ALLOY STEEL Year to Date
Eastern	25,864,060	1,496,011	8,836,767	70.3	68.9	111.5	109.1	74,936	480,760
Pitts.-Yngstn.	44,348,060	2,499,248	15,389,031	68.5	69.9	91.1	93.0	304,440	2,014,028
Cleve.-Detroit	12,791,780	696,968	4,238,835	66.2	66.8	117.8	118.7	42,466	304,863
Chicago	27,371,700	1,788,878	10,474,244	79.4	77.1	118.8	115.3	86,789	567,517
Southern	6,932,340	416,586	2,596,949	73.0	75.5	123.5	127.6	5,893	41,903
Western	7,022,470	465,943	2,595,786	80.6	74.5	128.0	118.2	5,802	41,480
TOTAL	124,330,410	7,363,634	44,131,632	72.0	71.5	107.0	106.2	520,326	3,450,551

* Included under Total Steel.
** Based on average production of the three years 1947 through 1949 as 100.
x Revised.

NEW 620-FT dock at Michigan Limestone's Port Dolomite on McKay Bay.

Limestone:

U. S. Steel nears completion of new dolomite project.

Start of quarrying operations and completion of processing plants is scheduled for late fall by U. S. Steel Corp.'s Michigan Limestone Div. Site lies near Cedarville, Mich., 5 miles inland from the brand new "Port Dolomite," which is 34 miles south of Sault Ste. Marie on Lake Huron.

Build Rail Line

Some 3 million tons a year of the high-grade dolomite limestone will begin flowing next spring. The high-quality deposit lies near the surface and contains about 45 pct magnesium carbonate and 55 pct calcium carbonate with only about 0.5 pct impurities. Silica, phosphorus and sulphur are unusually low.

Construction began in April 1953 when equipment and supplies were trucked to the site. At present, a 5-mile rail line is being built through rough terrain.

Stone from the primary crusher, now under construction on the floor of the quarry, will be hauled on the new rail line to secondary and tertiary crusher and screening plant near the port. The 1800-ton-per-hour plant will process stone into eight grades, ranging from 3 x 5-in. flux stone to rice size.

Load in 5 Hours

A traveling loading shuttle on the 620-ft long by 117-ft wide dock permits loading boats in about 5 hours without being shifted back and forth. Dock is at the edge of a natural channel which is 26 ft deep at low water. Harbor itself is protected by offshore islands.

Special Report

Continued

a factor in the market last October when competition forced it. It was applied to a limited number of products at first, but as the market situation deteriorated producers began absorbing on other products.

Meanwhile, it has become a routine part of the business. Producers have set up systems for maintaining up-to-date lists of freight charges that must be paid by their competitors to reach into the various marketing areas. The mills also have a good knowledge today of what their competitors produce, including size and shape limitations, and the location of the various producing plants.

Expansion:

Republic Steel to spend $10 million.

Directors of Republic Steel Corp. recently approved expenditures totalling nearly $10 million for expansion and improvements.

Largest part of the appropriations will be spent in Ohio's Mahoning Valley with more than $5 million scheduled for new equipment in the company's plants in Warren and Youngstown.

Included in the new projects is continuous hot-dip galvanizing equipment in Warren.

In Youngstown a substantial amount will go for a hydraulic pipe expander.

A new building and equipment at the Union Drawn Steel Div. plant in Gary, new hot-rolled strip coiling equipment in the Cleveland District and a new building and equipment at the Culvert Div. plant in Canton, O., are also included.

Announcing the appropriations, Charles M. White, president, commented, "Although the first 6 months of this year showed a sharp drop in steel production compared with 1953, we feel optimistic about the future of the steel business."

"Republic has shown that good earnings can be maintained with operations around 70 pct of capacity."

Work is to commence immediately on the continuous hot dip galvanizing project at Warren. New equipment will be installed in the present sheet and tin building and will increase the plant's finishing facilities by about 63,000 tons annually.

Other appropriations for the Warren and Youngstown plants include improvements of pickling facilities, roll turning equipment, alterations to an uncoiler, a new strip width gage and a thickness indicator for a cold strip mill.

The new building in Gary will house production facilities for an additional 1500 tons of carbon and alloy cold-drawn bars, and 600 tons of alloy cold-heading wire per month to meet increased demands.

POWDER: Wary on High-Density Iron

Good performance reports spark flurry of inquiries . . . But business "boom" is slow . . . Potential capacity about 100 tons monthly, use 10 to 25 tons—By *K. W. Bennett.*

When a flurry of enthusiastic inquiries developed on high-density iron powder parts in second quarter 1954, at least a handful of observers felt that this, at last, might be the year for high-density powdered iron.

Industry comment is cooler. Industry sources estimate potential capacity for production of the high quality electrolytic iron powder is currently about 100 tons per month. The figure would represent the absolute top, would represent capacity that is potential only and is currently used largely for other purposes. Estimates of actual consumption range from a conservative 10 tons per month to a high of 25 tons per month.

Density To 99 Pct

This despite some phenomenal performances reported for high-density powdered iron parts. National Cash Register, pioneer in application of the process to finished parts, was producing as many as 700,000 pieces per week by 1953 for 90 part applications, has been reported capable of nearly a million parts per week in 1954.

Pressing special powdered iron at 100,000 to 120,000 psi last year, the company's research metallurgists reported densities of 7.20 to 7.40 g per cc. Following coining or sizing, density might attain 7.60. On test bars that had been completely treated, tensile strengths to 170,000 psi were obtained. Final densities of 99 pct that of 1010 steel were consistently obtainable.

Autos Are Biggest Market

Pow-Met, first large jobbing plant in the field, will guarantee tensile strengths to 180,000 psi, impact strengths to 500 ft-lb, and finishes of 8-15 microinches—suggesting machined surfaces. Density range on these parts runs from 7.2 to 7.7 g per cc.

With Plastic Metals Div. the largest producer, and a producer of iron powder since 1933, there are about four suppliers of the iron powder. Some is being shipped in from Swedish suppliers, but the tonnage is believed to be small.

To date, the biggest user has been the automotive industry. Looking promising is the electronics industry, and farm equipment is eyed with some hope. Aircraft has been a market but not a big one, despite some fine showings there by high density iron powder parts. A powdered iron gear replaced a 4140 gear in one aircraft engine application, and the fabricator says he sold it at one third the final cost of the steel gear. It's run three times longer in tests than the gear it replaced.

Size of the part seems to be limited only by press capacity. Producing gears, cams, ratchets, and pawls, high-density iron powder fabricators have produced blanks that ran at least 8 in. in diameter and were 1 in. thick. They indicate this is just a start.

Currently, a plant producing parts in the 150,000-psi tensile strength class may have a heavy press with no more than 60 tons capacity. Press builders have been getting inquiries in the 200-400 ton range, but these have resulted in little business thus far in the Midwest. The East Coast has been producing some heavy press business but volume is still low.

Complicating the picture is some disagreement as to just how dense a part must be to be called "high density." Whereas densities of 7.2 to 7.6 g per cc are being obtained on production lots, it's felt that some producers regard a 6.5 to 7.0-density part as being in much the same category.

Press Makers Cautious

Caught in the middle of all this is the press builder. At least three indicated to THE IRON AGE that, while interested in high-density developments, they are making no strong selling efforts in this direction until the market pattern emerges more clearly.

A number of fabricating shops have been specifying equipment that could be used for both low- and high-density compacting of powdered metal. Most press jobs amount to reworking of a standard equipment line, though Baldwin-Lima-Hamilton has been active in equipment specifically aimed at this market.

Beside some increased electronic use, bigger shipments of heavier parts, including at least heavy-duty high-finish gearing, are rumored for late this year.

High Density Iron Powder Facts

Dimensional Tolerances—Can be as close as ±0.001 in. per in. on radial dimensions; peripheral dimensions can be as close as 0.0005 in.

Press Capacity—Ranges from as low as 4 tons at 35 strokes per minute up to 400 tons. This depends on part being produced.

Tool Life—Soft powder allowed a carbide die to produce 4.5 million pieces with only 0.0001-in. wear.

Machining—Cost savings as high as 50 to 60 pct have been reported. Can obtain surface finishes in 8 to 15 microinch range, less if needed.

Green Strength—Pressed at 60,000 psi, unsintered preform strength has been maintained at 1600 to 3200 psi in production.

Raw Material Cost—High, but offset by reduced finishing costs.

Advertising: C&O Campaign Pays Off

Railroad's series stressing role of traffic manager pulls enthusiastic response . . . Ads aid customers, avoid rapping competition . . . Spur management action—By R. M. Lorz

Ordinarily you would not expect to find the traffic manager for one of the nation's largest metal processing firms organizing a barnyard airlift to Jamaica. Yet in at least one instance a quick-thinking traffic control expert did arrange to air ship cattle in order to meet an agreement in the quickest and cheapest way.

This is just one of the many case histories recently brought to light by a provocative advertising campaign sponsored by the Chesapeake & Ohio Railway. For the past 2 years C&O has been effectively using some of the nation's leading publications and a vigorous direct mail program to relay a message to management. Main aim is to impress management with the importance of freight handling and transportation by publicizing the dollar saving contributions and general all-around value of the traffic manager.

Don't Rap Competitors

Although freight bills run into billions of dollars annually, industry has too often been inclined to show only passive interest in traffic. Harried traffic managers, saddled with routine assignments and hampered by shipping clerk status, have been handling this pot of gold in relative obscurity.

C&O drive to enhance the prestige of the traffic manager has made news for three big reasons: (1) It represents a refreshing departure from the usual fire and brimstone blasts against truckers and other forms of transportation. (2) It has sparked a tremendous response proving management is ready to listen. (3) It has started a trend toward organizational reshuffling which is raising the traffic manager to executive status.

This ad campaign is something more than a tricky gimmick designed to bring in more revenue. Copy sparkles and case histories all tell of dollars saved. But the important thing is that the pro-

gram is based on a long range outlook successfully tested in many other segments of industry before, i.e., spend less time arguing with your competition and more time helping your customers.

Ads Bring Action

According to A. S. Genet, vice-president in charge of traffic at C&O, promoting the cause of the traffic manager through appeals to his boss is good business "because we win his good will." Mr. Genet, who won the coveted Delta Nu Alpha award as "Transportation Man of the Year" in 1953, insists the campaign he originated isn't the least bit flag waving or altruistic. In his own words, "If we can raise the traffic manager to professional status by getting the executive's attention we will all have taken a big step toward better business practice and a freer economy."

The response Mr. Genet and his staff have received as a result of the traffic manager campaign seems to indicate clearly that top level management is more than ready to ferret out the hidden dollars in freight bills. Over a thousand congratulatory letters have been received, most of them from executives at the top. On a more concrete level, over 50 firms have contacted Mr. Genet to announce plans for reorganizing their shipping departments. That means action is being taken.

Staff Status Helps

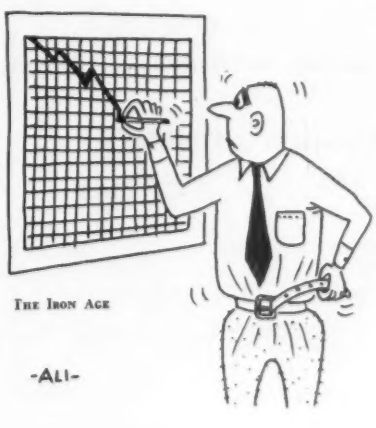
Traffic managers themselves have been pouring in responses out of gratitude for this sudden applause. One correspondent humorously capsulized shipping room reaction by hailing recognition of the fact that "a sharp traffic manager does more than get the boss in a bedroom on the 20th Century."

In addition to discussing specific individual problems many traffic experts agreed to the letter that there were several obvious benefits to be derived from elevating the traffic manager to staff status. These included better perspective and the opportunity to participate in policy decisions like selecting new plant sites; improved inter-departmental relations; better budgetary control and more time for concentration on rate classification problems.

Aim at Pockets

What were the original ads like and what did they have to say that did so much to liven up a usually dull subject? Keynote for the series was couched in the title of the first ad which told "A Remarkable Story About a Remarkable Man." Of course it emphasized the traffic man's key role in industry. Another eye catching ad headline plugged for cooperation with the traffic department through the exhortation, "Don't Buy Corn East of Pittsburgh." Another recently told how a firm saved over 40 pct on a printing press shipment by disassembling the press before shipment.

General reaction to these ingenious ads also underlines another fact for which C&O officials can take a well-deserved bow. Their novel approach to what had been a dry and sexless subject has proved beyond all doubt that it is possible to glamorize almost any business problem by analyzing the pocketbook. It also proves the old adage that it pays to advertise—especially if the ad is built around the customer and his problems.



TYPICAL AD in C&O's campaign is this one stressing importance of thorough study of freight rates and classifications.

Social Security:

Limited extension assured . . . Payroll deductions upped.

Congressional approval of legislation permitting limited extension of social security coverage is assured.

As Congress races toward the finish line of its current session, Senate Finance Committee approved and cleared for floor action an amended version of the Administration social security bill. The Senate was expected to take up the measure, H. R. 9366, this week.

In its present form, the bill would give eligibility for old-age and survivors insurance to nearly 7 million more persons. It would raise the cost of these benefits next year by $700 million.

Compulsory coverage would apply to 2.6 million more farm workers, 250,000 domestic employes, 100,000 industry employes who work at home, and 50,000 fishermen.

Optional under specific conditions would be coverage for some 3.5 million state and local government employes and about 260,000 clergymen.

What Changes Were Made

Other important changes made by the group included:

1. Raising to $1200 a year the ceiling on income a retired person age 65 to 72 may earn without losing old-age benefits. The present ceiling is $900, and the House voted to make it $1000.

2. Reducing from 75 to 72 the age at which a retired person may earn unlimited income without losing any OASI benefits

3. Providing higher minimum and maximum benefits for single and married retired persons.

In line with the need to pay for these higher benefits, social security payroll deductions would be raised next Jan. 1. Instead of applying to the first $3600 of yearly earnings, as at present, deductions would cover the first $4200.

The maximum increase to be paid by the employe and matched by the employer would be $12 a year, at the present tax rate.

Flow-Turning:

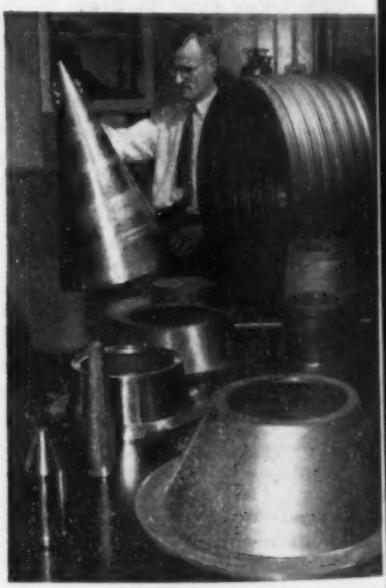
Variation of spinning craft produces jet parts faster.

Theory of flow-turning has been known for some 25 years; spinning, on which the process is based, dates back thousands of years. Today Pratt & Whitney Aircraft Div. is making modern jet engine parts by flow-turning—and doing the job faster, better, cheaper.

Process is actually a combination of spinning and cold extrusion in which a sheet metal blank or rough forged disc is rotated with a precisely shaped mandrel. A separately controlled roller is applied, progressively squeezing the workpiece over the mandrel instead of folding it back as in spinning. Blank diameter is the same as the finished part.

An example illustrates advantages Pratt & Whitney has derived from this method:

Starting with a 50-lb forging, Pratt & Whitney used to perform 20 different machining operations that took 4 hours to produce a 14-lb bearing support. In flow-turning, a 27-lb forged disc is the starting point. Just over an hour of rough machining removes 13 lb of excess. Then the part is finished by flow-turning in 5 minutes.



TYPICAL PARTS produced by flow-turning range from 1/32 to 5/16 in. thickness, vary from small cones to difficult corrugated cylinders.

WAREHOUSES: Sales Start Rebound

Business has passed bottom, is starting to climb . . . July vacations will be followed by renewed uptrend . . . Warehouses are buying more steel, too—By W. V. Packard.

Steel warehouse business has already hit bottom and is starting to edge up again. Improvement is noted both in shipments from warehouses to their customers and in shipments from mills to warehouses.

Reversal of the trend is significant, since warehouse business pretty well reflects activity in the economy as a whole. Outlook is thus brightened for a key industry where reports had been bleak for a good many months.

The more optimistic outlook featured a meeting of the Executive Committee of the American Steel Warehouse Assn. in New York last week.

The Association's monthly reports of tonnage shipments show some improvement during May and June, while shipments during the same 2 months last year showed a decrease. Shipments from mills to warehouses also increased during March, April and May, reversing a trend that began in March, 1953.

Vacation Dip Temporary

Reports for July will probably show another dip in steel warehouse business. But this will be due to the fact that manufacturing customers of warehouses are scheduling plant-wide vacations in July more than ever before.

Warehousemen are confident the July dip will be temporary, that the upward trend will resume in August and gain steam through the fall months.

Walter S. Doxsey, ASWA president, in commenting on the shipment figures, said that present warehouse activity is based upon actual needs of large and small steel consumers, most of whom have reduced their stocks to realistic levels.

Steel producers, therefore, can expect increased buying by warehouses in the near future, he predicted.

Mr. Doxsey and other members of the ASWA executive committee pointed out that the early months of 1953 were the best in the history of the industry, and that warehouses felt the shift to a buyers' market more quickly and more sharply than did steel producers.

C. L. Hardy, president of Joseph T. Ryerson & Son, Chicago, reported that warehouse price increases average about $4.50 a ton.

The increase is broken down as follows: Average increase at mill level is $3 per ton; cost of additional wage and fringe benefits at warehouse level, $1 a ton; additional indirect costs, 50¢ per ton. He said warehouses are endeavoring to hold prices to their customers so as not to exceed the net increase in costs.

But he warned that warehouse profit margins are dangerously thin. He pointed out that in 1953, one of the best years in the steel industry, the producing mills earned a modest 5.7 pct net after taxes on their sales dollar. But a survey of ASWA members showed that during this same period 80 pct of them earned less than 5 pct, with the average running a little over 3 pct. He compared this with department stores earning 2½ to 3 pct during the same period.

Steel products turnover was estimated at a rate of 1½ times per year at present compared with approximately 6 times per year at the height of the boom.

L. B. Worthington, president of U. S. Steel Supply Div., Chicago, pointed out that steel producers are considerably more interested in booking small miscellaneous orders than they were a year ago. Although this was anticipated, it is one of the important factors in the lower warehouse volume.

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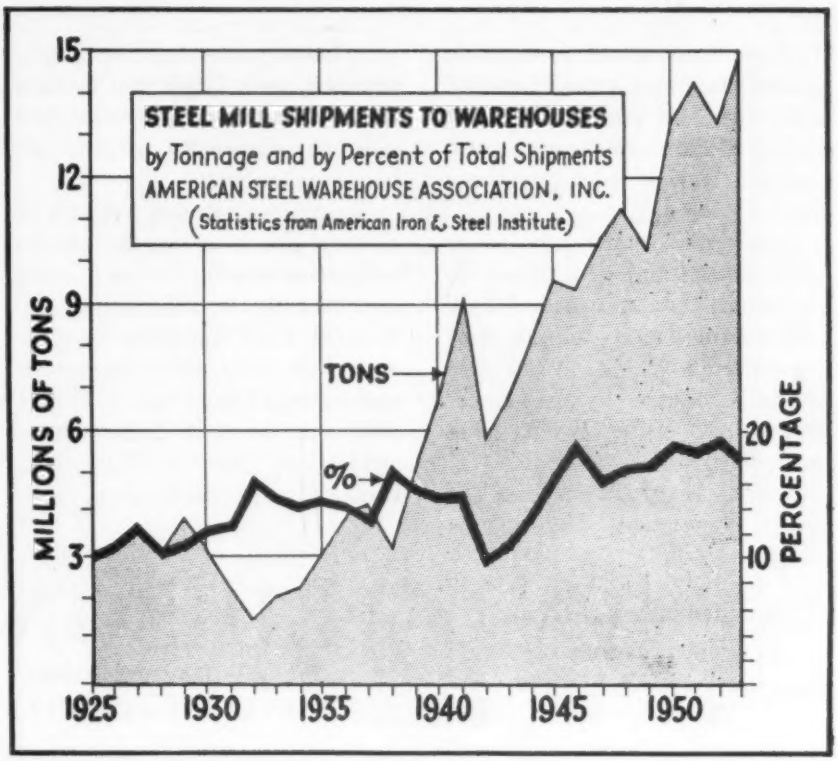

—Distribution—

Average warehouse order was about 1200 lb in 1953, compared with about 900 lb today.

Although warehouse orders have been getting smaller as producers scrounge for business to keep their mills rolling, Mr. Worthington believes the long term trend will be toward larger warehouse orders. He cited the speed of modern mills and costs of changing setups as deterrents to economical mill handling of small orders.

Earle M. Jorgensen, president of Earle M. Jorgenson Co., Los Angeles, reported that western warehouse business is running somewhat ahead of the bulk of the country.

He pointed out that the increase in steelmaking capacity in the West has made that area less dependent upon eastern mills, with resulting lower costs and quicker delivery. Western mills now supply 61 pct of the region's steel needs compared to only 30 pct in 1940, and a mere 20 pct in 1930.

F. H. Lovejoy, president of Wheelock, Lovejoy & Co., Cambridge, Mass., said warehouse business along the East Coast has been rather steady but slow thus far in 1954. He expects summer plant shutdowns to reduce shipments even further in July and August. He reported steel used for construction is moving fairly well.

Frank Pidgeon, president, Pidgeon-Thomas Iron Co., Memphis, said that warehouse demand in the South is holding up better than it is in most other areas. He declared that industrialization of the South and diversification of its industries point to long term growth of demand for steel.

Paul O. Grammer, president of Grammer, Dempsey & Hudson, Inc., Newark, N. J., reported that competition from foreign steel imports has been declining. He said this was a result of firming of European steel prices, since European mills are fairly busy.

APPLIANCES: Sales Top Predictions

Despite slow second half, '53 was record . . . Volume won't quite reach last year . . . Individual firms optimistic . . . Forecast second half boom—By K. W. Bennett.

General Electric last week made the comment that General Electric and Hotpoint appliance sales were "remarkably firm" and generally running ahead of appliance-electronic sales for the same period of 1953. Previously, Westinghouse, Norge, Emerson, and others had reported surprisingly good volume.

For an industry that had been freely forecast as whirling into a 10 pct (at least) decline in sales volume during 1954, the announcement suggested to many the whistling of one man in a graveyard at midnight. Nonetheless, the growing number of early returns suggest GE is not alone.

Close to '53 Level

After a very poor second half (by December, 1953, factory shipments of some appliances were running 39 pct below the same month of 1952) and a poor showing in the first 2 months of 1954, appliance sales began moving up. (THE IRON AGE, Mar. 25, p.71.) Sales of electric refrigerators and ranges for the 5-month period were about 15 pct below the record first 5 months of 1953.

Current industry forecast for 1954: Sales will hit within 6 pct of the 1953 high. With luck, and if the sales force holds up, they could be closer.

Using first half 1953 as a base, sales for second half 1953 in electric refrigerators and electric ranges fell to 61.9 pct and 63 pct of the base period, respectively. The first 5 months of '54 found them within 15 pct of the base period and climbing.

A major producer reports business running 10 pct ahead of a like period last year in first half 1954. Prospect for second half is "bullish" and the firm's July sales are running ahead of last year. Last year's July sales forecast the beginning of a 7-month downturn. Dealer inventories of this company's products are probably 25 pct below last year's. And dealer sales are running 5-6 pct ahead of jobber sales.

Will Boost Buying

Another top producer is running 5-10 pct ahead of first half last year as his May and June totals shape up. His distributor inventories are low. July is at last year's sales level for that month. This firm expects an upturn.

A major distributor says he will increase fall purchases from the factory by 5-8 pct. He regards dealer inventories as "dangerously low."

A third large producer is running even with first-half 1953 (actually at about 1.5 pct ahead) after an extremely poor January and February. This manufacturer will do slightly better than last year, exceeding that year's record output by an estimated 2.5 pct.

Still another major producer is running 10 pct under last year's first half (or 5 pct ahead of the total appliance industry figure) and finds the market still brightening. Most optimistic source contacted by THE IRON AGE, this manufacturer believes second half 1954 will, for his firm, exceed the same period in 1953 by 40 pct.

Inventories Are Low

Individuals are increasingly hopeful, though members feel that "the industry" will run under 1953 by 5 to 10 pct. With each hopeful figuring his own sales as high (1953, despite that dismal second half, was a record year), someone will have to suffer. A number of small producers are foreseeing a dark year, particularly because they are still suffering from the sharp cutback in factory sales in latter 1953.

Dealer and jobber inventories are low. In the June pickup, a few large producers were already being caught with low finished goods inventories and a completely unexpected volume of dealer orders. Factory raw material stocks are low, as are stocks of jobbed appliance parts. Surplus that retarded impact of the June sales pickup wasn't felt at the supplier level, largely because of swollen parts inventories at the factory level. These have been reduced.

Television sets are another hint that consumer demand is far stronger than was expected in 1954. TV retail sales, despite colored television talk, hit 2,152,515

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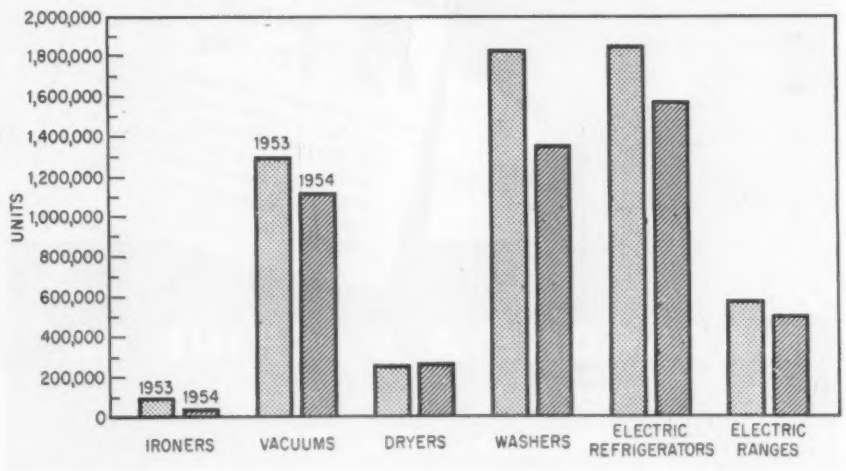
Appliance Sales Off From Last Year

(Figures cover first 5 months '53, '54)



sets in first quarter 1954, as compared with 2,100,620 in first quarter 1953. TV was forecast a weak seller for this year.

Opinion of summer selling varies. Said one association executive, "We have been hearing good reports of July sales. Better than we had any reason to expect."

Said a manufacturer's sales manager, "We are fighting with our teeth to keep our July sales level up. But if we can hold the line through July and August, there's no doubt that from then on we start climbing."

Steel:

Building, rails buck dip in Canadian steel demand.

Canadian steel business is swinging into more normal channels following the rush of order taking throughout the war years and the years shortly following postwar period. Demand shows a sharp decline from a year ago and overall production has dropped about 35 pct.

Greatest slump is in sales to the automotive industry. Figures for last March show the automotive industry taking 60 pct less steel than a year ago, falling from 37,600 tons to 14,800 tons. Steel consumption has also dropped in most other branches of industry, but building trades have been more active with persistent heavy demand for steel.

Steel requirements from the railways also have been on the upgrade, showing an increase of 60 pct in March over the corresponding month last year—from 26,400 tons to 42,300 tons. Steel officials point out that conversion to diesel engines has had marked effect on railroad steel demand.

Canadian steel producers are finding less competition from imports than a few years ago, although European producers are still pressing for orders in the Canadian market.

Among some of the major steel mills there have been fairly large layoffs of workers due to slackening demand and curtailed steel production.

MERGER: Rumors Buoy Steel Stocks

Talk of Bethlehem-Youngstown merger focuses Wall Street attention on steel stocks . . . Hit '54 high . . . Deal would give companies better geographic distribution.

Rumor of merger talk between Bethlehem Steel Corp. and Youngstown Sheet & Tube Co. was probably only one of the factors spurring steel stocks to new highs for the year last week.

But the rumor did focus Wall Street attention on steel stocks which some feel have lagged other offerings on the Big Board.

In addition, second quarter earnings reports are expected to be relatively favorable in spite of production declines in the industry. A few companies have already reported earnings, but the bulk of the industry, including Bethlehem and U. S. Steel will release their financial reports this week.

Still another factor in steel's bullishness might have been announcement of an offer to buy Follansbee Steel Corp. of Pittsburgh. Mark A. Follansbee, president said the board of directors had received a cash offer from substantial interests to buy all the company's present operating property. He said if the sale were consummated the company would enter new fields of activity.

From Bethlehem: "No Comment"

Whatever their motive, investors were giving steel a big play. *The New York Times* reported that on Thursday 17 of 34 steel and iron common stocks listed on the New York Stock Exchange rose to new highs for the year. Also, 6 of the 15 most active issues on the Big Board were in steel. Prior to the spurt steel stocks had been showing strength for several weeks.

Rumor of merger talks between Bethlehem Steel and Youngstown Sheet & Tube is not new. But presence in New York of J. L. Mauthe, president of Sheet & Tube, and James E. Bennett, secretary, heightened interest.

And the wording of a "no comment" statement from Bethlehem added to the speculation. The statement said "We have no comment to make on any such rumors." This caused some sources to wonder why the company had not merely denied that merger talks were being held—if such were the case.

Would Fill Midwest Gap

How well would the facilities of the two firms fit together? While there is considerable duplication of products offered, location of the plants is such that a merger would give much better geographic distribution.

Bethlehem's plants are concentrated in the East and West Coast. Major facilities are at Sparrows Point, Md.; Bethlehem, Steelton, and Lebanon, all in eastern Pennsylvania; Johnstown, Pa., near Pittsburgh; and Lackawanna, N. Y., near Buffalo.

Bethlehem Pacific Coast Steel Corp. plants are at Los Angeles, South San Francisco and Seattle.

This leaves a big gap in the Midwest which could be filled in by Youngstown Sheet & Tube's facilities in the Ohio Valley (at Youngstown, Campbell and Hubbard, Ohio) and at Indiana Harbor and South Chicago.

Marcus A. Follansbee
President
Follansbee Steel Corp.

With acute competition in the steel market today many steel firms are absorbing freight. The rumored merger could consequently result in extensive freight savings for Bethlehem and Sheet & Tube during periods of slack demand. And in time of tighter supply when the buyer picks up a bigger part of the freight bill, he's more likely to buy from a nearby mill.

Bethlehem is the nation's second largest steel producer; Sheet & Tube is sixth largest. Annual steel ingot capacities are: Bethlehem Steel, 17,600,000 tons; Bethlehem Pacific, 900,000 tons; and Sheet & Tube, 5,500,000 tons.

Is Merger Legal?

Regarding the legal aspects of any merger, there is ample authority in Sec. 7 of the Clayton Act for Federal Trade Commission to deal with any merger which lowers competition substantially.

But FTC Chairman Howrey has shown in his comments on the Pillsbury Mills merger case that he doesn't find in Sec. 7 an absolute formula for determining if two or more firms should be allowed to consolidate.

He said last winter "There must be a case-by-case examination of all relevant factors in order to ascertain the probable economic consequences" of corporate mergers.

Companies wanting to merge can ask FTC or Justice Dept. for informal advice on whether any antitrust proceeding might ensue. Such advice isn't binding on the government agencies, and sometimes it's ignored by companies themselves. But it is of general value as an informal guide. Neither Bethlehem nor Sheet & Tube had requested such advice.

Republic's Earnings, Output Up

Second quarter net earnings for Republic Steel rose $2,633,921 over first period levels to $13,712,933, the company reports.

Ingot rate was 69.9 pct of capacity against 69.4 pct in first quarter and 100.3 in second quarter 1953. Earnings per share of common stock were $2.22.

Surplus:

Personal property sales under new Defense Dept. policy.

Surplus personal property sales by Defense Dept. are to be effected on the basis of a new program set up to simplify selling while protecting the rights of small businesses and individuals wishing to buy.

Representatives of industry helped in developing the program which applies to all preparations for sale and actual sales of surplus personal property in Defense Dept., including contractor inventory and foreign excess.

Features of the plan include:

(1) Provision for using U. S. Commerce Dept. recommendations for modifying the impact of sales on commercial markets.

(2) Advance reporting to Commerce Dept. of all sales of surplus usable property within the U. S. having an acquisition cost of $250,000 or more.

(3) Establishment of a uniform deposit of 20 pct of bid price, when a deposit is required.

(4) Institution of a sealed-bid procedure in certain cases to accommodate prospective buyers who cannot personally attend an auction.

Up to the military departments is the job of implementing the program at an early date.

Need an ex-Naval Officer?

Industrial companies are being canvassed by the U. S. Navy, which is undertaking to find jobs for 860 reserve officers involuntarily leaving the service.

U. S. Chamber of Commerce and other organizations are giving aid by distributing to their members the facts on the Navy replacement program.

Among the officers, who are being released to bring Navy commissioned strength within tightened budgetary limits, are production management specialists, accountants, geologists, physicists, and manufacturing, chemical, civil, electrical, and mechanical engineers.

Average age of the officers is between 30 and 40 years. Ranks held range from lieutenant and captain.

Qualification cards on these officers have been sent to the Chief of Naval Air Reserve Training, Naval Air Station, Glenview, Ill. Personnel directors in industry may get from that officer the names and qualifications of officers who wish to be placed by this procedure.

Adopt New Construction Policy

Private contractors will no longer be asked to submit alternate bids for materials and building methods for Army and Air Force construction projects. This change results from a new bid policy by which Defense Dept. hopes to obtain better construction more economically.

Specifications accompanying invitations to bid will provide for optional materials or methods consistent with good engineering.

As new materials or methods become available, they may be included in possible government designs and advertised on separate bid schedules.

Contracts Reported Last Week

Including description, quantity, dollar values, contractor and address.

An/usm-26 (fr-38/u) frequency meters, spare parts, 192, $542,950, Hewlett-Packard Co., Palo Alto, Calif.

Model an/trm-3 sweep signal generators, 152, $544,587, Transitron, Inc., N. Y.

Model A-19 air turbine starters, 132, $198,569, Sawyer Bailey Corp., Buffalo, N. Y.

Type MB-1 aircraft crash fire fighting trucks, 8, $3,354,592, Marmon-Herrington Co., Inc., Indianapolis, Ind.

X-ray apparatus, dental, 1300, $565,500, Professional Equipment Co., Maywood, Ill.

X-ray apparatus, dental, 1051, $463,785, Universal X-ray Products, Inc., Chicago, Ill.

Cartridge, photoflash, M123, 335942 ea, $1,640,384, Bermite Powder Co., Saugus, Calif.

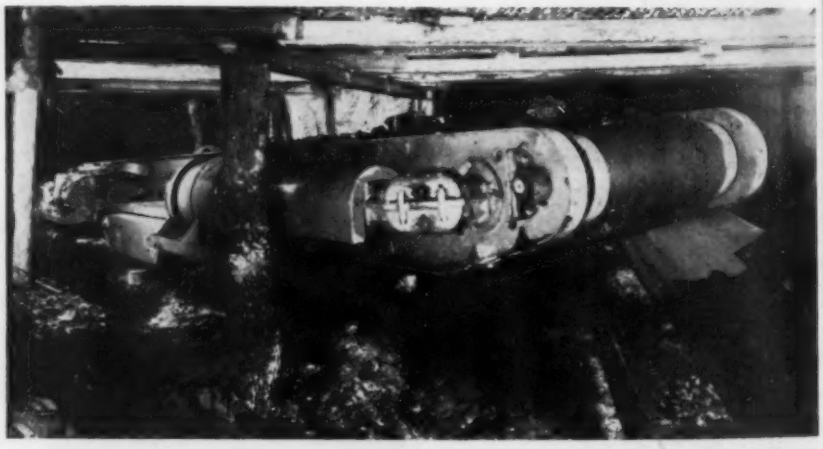
Bayonet knife, M4, 44586, $87,388, Imperial Knife Co., Inc., Providence, R. I.

Replenishment of commercial vehicles, 126 $141,305, Ford Div., Washington, D. C.

Replenishment of motor vehicle parts, 302, $287,066, Diamond T Motor Car Co., Chicago, Ill.

Spare parts for A/C wheels and brakes, $106,019, The Goodyear Tire & Rubber Co., Akron, Ohio.

Materials Handling



Conveyor Fills Robot Miner Missing Link

Joy Manufacturing Co. has come up with the "missing link" between the continuous miner and the rapid removal of coal from the mine face. J. D. A. Morrow, president of Joy, predicts his company's new extensible belt conveyor will increase productivity as much as 50 pct without extra workers.

The new machine is built in such a way that it can follow the continuous mining machine as it works its way into a coal seam. This is accomplished by the addition of extra belt lengths as required. By means of the extensible conveyor coal moves directly from the mine face to mainline belt conveyors or haulage cars for removal to the surface.

"We have licked," says Mr. Morrow, "the biggest bugaboo in continuous mining: Downtime while waiting to get the coal away from the fast-producing continuous miners."

REPORT TO MANAGEMENT..

A comeback for automotive

Auto industry is at long last coming out on top in its crucial inventory battle. But this doesn't mean there'll be a sudden surge of automotive strength. You can figure auto output in last half '54 will be even less than in the first 6 months.

What the inventory correction does mean is this: In '55 carmakers will be able to step up production, won't have to worry so much about huge stocks of unsold cars in dealers' yards. And with the general uptrending of the economy dealers can expect increased new car sales.

You can be sure fierce competition will continue in the auto industry throughout 1955, but in the scramble it's very possible Detroit may have one of its best years ever. And certainly dealers won't be forced to operate on an average profit margin of 0.8 pct (before taxes) as they did early this year.

Will new tax bill help you?

There's no ironclad rule you can use to determine whether your firm will benefit from the more liberal depreciation policies permitted by the tax reform bill. That's something you'll have to check carefully with your tax consultants.

But you can be certain of this: If your firm buys equipment that has a comparatively short useful life, or if you can expect technological advances to make your new equipment obsolete within a few years, it will probably pay you to use the new declining balance writeoff.

If the Democrats take over

If the Democrats win out in the upcoming congressional elections you can expect a sudden chilling of the currently warm business climate. And if your firm's in the top brackets a Democratic victory this fall is certain to cost you money.

You can be sure the scheduled reduction in the corporate tax rate from 52 pct to 47 pct won't get through if the Democrats are in charge.

Political tide was swinging away from the Republicans earlier in the year because of the business decline, McCarthyism, indecision on Indochina. But now the Republicans seem to be regaining lost ground. It's too early to tell if this trend will continue.

The farm vote, of course, will be extremely important. This fact is stated so often it's become a cliche—but many people have forgotten why the farm vote is so vital. The facts are: 83.1 pct of the territory represented in the Senate is rural territory; 54 pct of the senators and representatives now in Congress were elected by rural votes.

Freight cars hit bottom

Freight carbuilders who were having their own private recession long before the decline hit the rest of industry still show no signs of snapping back. Order backlogs have sunk to 4818 which could be wiped out in a month of full-scale production.

You can figure the carbuilders will keep cutting output so they'll have something to work on while waiting for an upturn in new orders. This won't come soon.

Industrial Briefs

Gets Contract . . . Temco Aircraft Corp. has been awarded a multi-million dollar contract for production of aft fuselage sections for the Republic F-84F Thunderstreak jet fighter-bomber.

Scholarship Awarded . . . Arthur F. Lukowitz, Chicago, has been awarded a scholarship established recently by the Link-Belt company at Illinois Institute of Technology.

Rep Appointed . . . Cleaver-Brooks Co., Milwaukee, appointed the Harold R. White Co., Baltimore, as manufacturer's representative for the sales of its boiler equipment.

Signs Contract . . . Arthur D. Little, Inc., Cambridge, Mass., signed a contract with the Foreign Operations Administration of the U. S. Government for continuation of the industrialization project in Egypt under the Technical Cooperation program.

Any Suggestions? . . . North American Philips Co., Inc., Mt. Vernon, N. Y., has a new Reward for Ideas employee suggestion plan with cash prizes based on merit. The new plan is aimed at improving product design, manufacture and sales techniques including all conditions effecting a net saving of time, labor and materials.

In Training . . . Carboloy Dept., General Electric Co., Detroit, has a new training course in the use, design and application of cemented carbide tools. Open to all individuals interested in carbide use, the first 5-day session started July 12.

Hear Ye . . . Packard Motor Car Co., Detroit, was awarded a major contract to design and develop a new gas turbine engine for use by the U. S. Navy.

Extends Line . . . Minneapolis-Honeywell Regulator Co.'s Industrial Div. added three types of extension wire to its product line. The new types are: a 14-gage extension wire, a 14-gage Chromel-Alumel wire both with asbestos or waterproof insulation, and a 20-gage Chromel-Alumel extension wire with waterproof insulation.

All-Time High . . . Colorado Fuel & Iron Corp.'s Allen Mine, Weston, Colo., produced 3177 tons of coal, on June 9 to set an all-time daily production record for the company.

In Full Swing . . . The new Eaton Screw Products Co. plant in Eaton, Ohio, recently built and dedicated by Parker Appliance Co., is now in full operation.

Pays Homage . . . Clearing Machine Corp. held a memorial dinner at the Blackstone Hotel, Chicago, honoring its nine original employees.

They've Moved . . . R. K. Le Blond Machine Tool Co. has moved its Chicago district office from 20 N. Wacker Drive to 6429 West North Ave., Oak Park, Ill.

HAROLD B. REID, recently retired sales manager of Associated Spring Corp., Bristol, Conn.

Awarded . . . Wilputte Coke Oven Div., Allied Chemical & Dye Corp., received a contract for the design and construction of three 64-oven batteries of Wilputte coke ovens with auxiliary equipment for the Clairton, Pa., works of U. S. Steel Corp.

Enlarges Plant . . . Franklin Electric Co., Inc., recently placed contracts for the construction of an addition to its main plant in Bluffton, Ind., doubling its size to provide for employment of up to 1000 workers.

Century Mark . . . William A. Prentiss, president, George W. Prentiss & Co., Holyoke, Mass., celebrated his 100th birthday earlier this month.

Dividend . . . Continental Can Co., Inc., New York, declared a regular quarterly dividend of 75¢ per share on common stock, payable Sept. 15 to holders of record Aug. 25.

Enters Field . . . Hely & Patterson, Pittsburgh, and Charles E. Agnew, Cleveland, have signed a sales agreement giving Hely & Patterson exclusive marketing rights to the Agnew Sintering Machine.

Purchased . . . Newton Co., Manchester, Conn., has purchased the machinery and equipment of American Tool Works of Hartford, Inc.

New Furnace . . . Rust Furnace Co. will construct a new billet heating furnace for the American Steel & Wire Div. of U. S. Steel at Cleveland.

Two Plants . . . Pennsylvania Salt Mfg. Co. will build two new plants to provide better customer service for expanding markets for special chemicals. They will be at Delaware, Ohio, and at Chicago Heights, Ill.

there's a new *Sweetheart* on the production line

THE ALLIANCE PNU-DRAULIC BENCH PRESS

No press available was able to meet the specifications of our precision and efficiency minded production engineers who are responsible for the manufacture of 70% of all the phonograph motors produced in the United States, 70% of all television antenna rotators and other intricate and precise consumer products—so we designed and produced a press to satisfy our own exacting needs.

After three years of exhaustive testing and 'round the clock use on our high speed production lines operated by women, we now offer the Alliance Pnu-Draulic Bench Press to YOU. Powered by the shop air line, it is completely self contained, has no motor, pump or electrical connection, few moving parts, is easily moved about and occupies only 1⅓ square feet of space.

The new Alliance press has the high speed of air combined with the smoothness of oil, delivers 5 tons of pressure at 100 psi air pressure and does not depend on operator "skill" or "feel." It is accurate at any pressure from 100 to 10,000 lbs., has built-in two-handed safety trip, all-steel welded frame, two-inch diameter precision ground ram, automatic built-in timer, a stroke adjustable from three inches down to zero, and has a stepless adjustment of ram pressure through complete range of press power. Because ram closing power is only a fraction of the final power and because of the fact that high pressure does not kick in when part is misplaced in die, IT REDUCES DIE BREAKAGE TO A MINIMUM!

Send for FREE bulletin today on the Alliance Model 500 Pnu-Draulic Bench Press.

THE **ALLIANCE** MANUFACTURING CO., ALLIANCE, OHIO

Wildcat Walkout at Dodge

Three men leave job, start landslide of layoffs . . . 38 pct of Chrysler workers idled . . . Settlement reached . . . Industry sales climb in new, used cars—By R. D. Raddant.

More than 45,000 workers were idled at Chrysler plants in the Detroit area last week after a walkout by Dodge Local 3, United Auto Workers (CIO). Chrysler had earlier announced plans for workfurloughing of 35,000 employees at its plants across the country. The strike had the effect of idling 10,000 more than that figure in the Detroit area alone.

Trouble started when three employees at Dodge Main decided they didn't like a new method of installing garnish molding. Work was switched from a single-man operation with the worker riding in a car body as it moved down the line, to a system of individual stations.

Three Walked Out . . . The three objected, and were reported to have left the job. After being given a 1-day disciplinary layoff more employees quit when replacements for the three reported for work. Altogether about 5500 people went out of action as output felt the bottleneck.

Following this a picket line was thrown up around Dodge Main, the Winfield Foundry, and the Lynch Road Garage. According to Chrysler, the pinch began to be felt most sharply when the Garage went out of action, since the trucks used for shuttling components from plant to plant were operating out of that central point.

The strike box score showed: 10,000 on strike; a total of 45,000 idled in the 10 Detroit Chrysler owned plants.

Add Inventory Layoffs . . . Further complicating the picture, there was an announcement that Chrysler inventory taking would begin in August, and that the Detroit Plymouth plant would begin inventory in the second week in August. The August shutdown planned at that time to affect approximately 38 pct of the corporation's 107,000 employees over probably a 2-month period, was to be used in realigning equipment preparatory to introduction of new models in the Fall.

An automotive publication had carried a report that all Chrysler divisions would halt assemblies 6 to 7 weeks to allow for equipment changeovers, and indicated Dodge, Chrysler, and DeSoto would be going out at staggered dates in August.

Of the original three who began the difficulty: one had failed to return to work. The other two workers reported for work before the picketing began, were charged with causing a slowdown as the working day progressed, and were finally discharged.

A settlement was reached after UAW-CIO headquarters refused to sanction the walkout.

HIGH VELOCITY water in plastic nozzle is used by GM's Transmission Development Group to study shape of torque converter blades.

Sales Move Up . . . Midsummer auto sales, apparently taking a page from the weather book, began to set a hotter pace last week after topping the 3 million mark July 14. With the speedup in auto turnover, dealers are reported to be about seven days behind the 1953 sales total.

Dealers in automotive lines are noting something that has been increasingly apparent in the appliance industry. If January and February sales hadn't been extremely poor, the first half of 1954 might be second only to the all-time record set in first-half of 1953. As it is, first-half 1954 will shape up as number four, with first-half 1953, 1950 and 1951 exceeding it.

Used Stock Moves . . . The February, May, June rise has been noticeable even in used car market, where stocks have sunk to the lowest point thus far this year and volume is holding well. Part of the brisker tone can be traced to price reductions on most used models, with the exceptions of '53's and '54's, but there were prophets in early 1954 who proclaimed that this year would be one of the top sales years for used car selling and their prophecies still seem to be gaining ground.

At the same time, exports of trucks and cars have risen 14.5 pct during the first five months of the year, and C. B. Thomas, president of the export division of Chrysler, indicated that during the same period Chrysler had moved ahead of the industry total, had boosted its own export total 21.3 pct over '53 pace.

Turn Page

Air Conditioning While-U-Wait

It's not news that weather affects the way your car drives. As the temperature and humidity climb, the horsepower has a tendency to drop. When the barometer starts up, so does the horsepower. Or, according to Ford engineers, when your car is driving at 100 mph, 70-80 pct of its power is expended in pushing aside the mass of air through which the vehicle travels.

With engineers working on the mechanical aspect of all this, it's comforting to know that there is already some relief for the human element. Down in the Southwest, where drivers reach temperatures almost equivalent to that of the engine, filling station attendants are putting flexible airhoses in the windows of their customers' vehicles, squirting them full of cooled, dried air.

Chrysler Airtemp reports having produced several dozen waterless, portable 3-ton capacity air conditioners for southwestern stations. The suffering customer rolls down his window a crack, the attendant puts in the hose leading from the air conditioning units, and the passengers and driver are rapidly and painlessly reduced again to driving temperature. Initial reports suggest that motorists in the area, where temperatures reach 100°F, like the idea. Aircraft manufacturers have adapted the idea for crews working inside fuselages with an equal degree of satisfaction.

Fewer Cars Made in Michigan

A unique survey by Automotive News shows the tremendous geographic spread of the auto industry.

Less than one-third of all autos produced in the U. S. are turned out on Michigan assembly lines, traditionally the home of the industry. In fact, automobiles are assembled in 20 of the 48 states.

In comparing the first halves of 1953 and 1954, the survey shows that Michigan's percentage of toal output has dropped from 35.8 pct in 1953 to 30.8 pct in 1954.

Research:

Ford expands tractor, auto test areas.

Initiation of the industry's largest vehicle testing area was undertaken recently when the Ford Motor Co. announced the purchase of 4000 acres in Macomb County, north of Detroit. The new purchase will give Ford more than 8000 acres of testing ground.

Included in the new facility will be maintenance and storage garages, a 5-mile track and a network of test roads, a fueling structure, and special testing obstacles. Operations are to begin during 1956, and at a distance of only 45 miles from the Dearborn headquarters.

At the same time, and at a different point within the Ford Motor Co., came word that Ford's Tractor & Implement Div. would establish a farm equipment engineering center for the express purpose of developing, designing and testing farm machinery.

The new facility, to be located at Birmingham rather than the present location of the Tractor Engineering Dept. which is housed at the Rouge.

The farm machinery center suggests a move that has been developing rapidly among nearly all major producers of agricultural equipment since 1950.

International-Harvester, at Chicago, frankly stated the need last year when John McCaffrey, company president, pointed out that farm equipment, like the automotive industry, must achieve a positive yearly growth, what he called "controlled obsolescence."

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
July 24, 1954...	108,459*	19,566*
July 17, 1954...	111,045	19,718
July 25, 1953...	143,587	29,287
July 18, 1953...	146,208	29,391

*Estimated. Source: *Ward's Reports*

THE BULL OF THE WOODS — By J. R. Williams

where only the right steels work

J&L sheet and strip

serving steel users everywhere

linked by water to the Middle West and South

J&L's nation-wide distribution is supported by its location and facilities for prompt, dependable river, rail, and truck shipments.

Your particular requirements for formability, uniformity, and drawing qualities determine every step in the production of your order of J&L Sheet and Strip.

An understanding of product end use, and the physical and chemical properties required to do the job, are the foundation for J&L quality control practices. And J&L quality control assures accurate adherence to your specifications.

You can depend on J&L for Sheet and Strip Steel that helps you get the best out of high speed production equipment . . . adds to the value of your finished product.

Jones & Laughlin

STEEL CORPORATION — *Pittsburgh*

J&L STEEL

Business Pickup Will Help Ike in Fall

Substantial increase in business tempo after Labor Day expected . . . Would help Republicans at polls in November . . . Nudge Taft-Hartley again—By G. H. Baker

Substantial evidence of underlying strength despite this summer's seasonally slow business points to a sturdy pickup in orders soon after Labor Day. Steel, autos, appliances all are tabbed for fair shares in the coming rise.

Because industrial production is running about 9 pct under a year ago, there's no call for hysteria. The U. S. has during the past 18 months been in the throes of transforming itself from a wartime to a peacetime basis.

Everything considered, it is amazing that the recession of the past winter and spring wasn't a lot worse than it was.

Other Way's Hard . . . It doesn't depress the economy to go from peace to war. Huge sums of defense money naturally creates inflation and what some economists like to call "prosperity."

But to reverse the process, to turn the country from war to peace without seriously upsetting national production and employment, is no simple trick.

These facts, now being discussed in Republican congressional circles, may help Mr. Eisenhower's cause at the polls in November. It is increasingly apparent, regardless of partisan politics, that the Eisenhower Administration has accomplished the thankless transition from war to peace without hurting any major segment of management, of labor, or of consumers.

Ike Irks Them . . . Republican leaders at the Capitol are openly irked at Ike's insistence that they have another go at rewriting the Taft-Hartley labor law. But they're willing to go through the motions in order to pacify the boss, for nearly all Republicans are "running scared" in their local campaigns. They are counting heavily on Ike.

In the ordinary course of legislative procedure, the referral of any bill back to committee "for further study" spells its defeat for the duration of the congressional session. So when the Senate voted on May 7 to recommit proposed Taft-Hartley changes for further examination, members of both parties knew that the issue, right or wrong, would not arise again this year.

Fair Deal Democrats rejoiced loudly that they had "blocked encroachment of the slave labor law," while Southern Democrats sent home word that they'd stymied a move to abrogate "right-to-work" laws.

Want It As Is . . . Obviously, these two views do not match up—as the speech-makers well know. But there has long been a strong suspicion among Republican leaders that many Democrats would rather have Taft-Hartley "as is" as a campaign issue than have the law amended as demanded.

The probability that the controversial labor law will be rewritten this year is very slight, despite the spirited urging of Mr. Eisenhower. But there is still a possibility that something might happen.

Watch the Deficit . . . Ahead of the Eisenhower Administration now is the job of holding the national deficit to less than $3 billion at the end of the current fiscal year.

Most recent official estimate is that the size of the deficit on June 30, 1955, will be around $2.9 billion.

One reason for assuming the estimate will not be exceeded, is the recent disclosure that the government saved more money than it expected in fiscal 1954. Instead of completing the year with a minus reading of $3.274 billion as expected, the government found itself with a deficit of $3.029 billion.

This achievement was made despite the fact that actual Treasury receipts were $3 billion less than was anticipated last January. At the same time, however, expenditures were reduced by $3.3 billion below the figure predicted then.

One primary obstacle to deficit-cutting this year has been pointed out by Treasury Secretary Humphrey. He has indicated that the excise tax cuts voted last spring automatically would have the effect of raising the deficit $1 billion.

As of now, U. S. Budget Bureau is not making public its views on chances for a smaller deficit next June 30. The agency believes it is still too early for predictions.

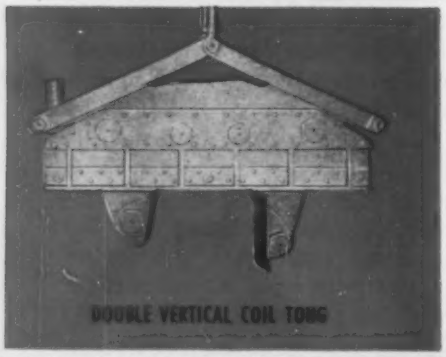
Work on Controls . . . Defense mobilizers who are drafting economic controls, although unhappy with the reaction when it became known that they were writing the outlines for future price, wage, and credit controls, are expanding their efforts. They successfully secured an increase in their budget from a Congress which was intent upon producing a bare-bones budget, and have hired at least one new top executive to speed up the program.

Turn Page

DOUBLE "C" HOOK

MOTORIZED ROTATING HORIZONTAL COIL TONG

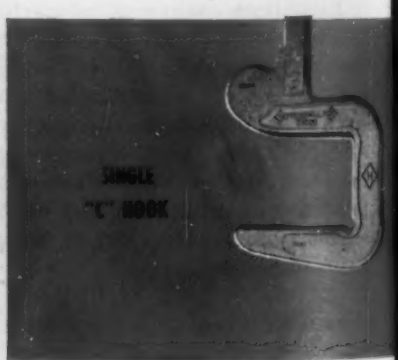
SINGLE VERTICAL COIL TONG



DOUBLE VERTICAL COIL TONG

MOTORIZED NON-ROTATING HORIZONTAL COIL TONG

TONGS TO LIFT COIL HORIZONTAL AROUND O.D.



SINGLE "C" HOOK

HORIZONTAL COIL TONG OVER ENDS

Engineered for your Coil Handling Jobs

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AUTOMATIC AND MOTORIZED

SAFE-T-TONGS

Coil handling problems differ from one plant to another. And Heppenstall's Safe-T-Tongs are designed to fit each set of specific requirements . . . *yours* for instance.

Heppenstall's Safe-T-Tongs (for coils) are lifting steel strip weighing up to 35 tons per coil—safely and economically. They are designed to lift coils vertically or horizontally—or grasp coils circumferentially as required.

Heppenstall Safe-T-Tongs for coil handling jobs have stepped up efficiency—lowered overall costs—decreased damage to coils—and improved safety conditions in plant after plant. They'll do the same for you.

Our engineers would like to work with you in designing tongs to meet *your* specific requirements. Write us today.

You'll want this new catalog. It contains solutions to many materials handling problems. We'll be pleased to send you a copy. Address: Heppenstall Company, Pittsburgh 1, Pa.

Heppenstall

. . . tongs for every lifting problem

Result of the fireworks, however, has been that the economic planners are more secretive now about details, miss no opportunity to make it known that they don't want controls anymore than anyone else. Even business executives called to Washington for advice are being cautioned not to talk about the project.

The defense mobilizers realize, however, that controls planning is a shifting thing, must move as the economy changes. So they've written "patterns," to keep them up to date with changing events.

OK Return of Alien Property

Legislation to return millions of dollars worth of alien property seized in wartime to former owners has been approved by the Senate Judiciary Committee. The bill would completely revamp the nation's alien property laws and is aimed at getting the Federal Government out of the business within 3 years.

Provided for under the measure would be return of most property held by the government. The President could, however, direct that it be sold to U. S. nationals by its former owners if he rules it is in the "national interest."

General Aniline & Film Corp., which the government contends was owned by German interests, is one of the biggest pawns in the alien property controversy. Ownership of the firm—whose assets have been valued at between $60 and $100 million—has been in dispute for several years.

Extend Scrap Tariff Suspension

Senate Finance Committee has approved a House-passed bill to continue the suspension of tariffs on imported scrap, except for lead and zinc scrap, for another year.

Under the bill, import duties on scrap would be suspended through June 30, 1955. Duties will continue to be levied on lead scrap, and on zinc scrap unless it is shipped into this country under an agreement dated prior to July 1, 1954.

The Committee agrees with the House that the suspension should be continued because a re-imposition would tend to increase the cost of military items.

Wages:

Deny request for re-definition of "area of production".

Petitions requesting Labor Dept. to make basic changes in definition of the "area of production" covered by regulations administered by the Wage-Hour Div. are to be denied.

One section of the Fair Labor Standards Act permits exemption from both minimum wage and overtime pay provisions for employees in certain processing fields. Exemption depends on whether the employee and employer are covered by the "area of production," as now defined.

In effect since late 1946, the present definition is based on the distance over which commodities move to the plants where the operations are performed and on the population of the community.

Many attempts to write a better definition, says Wage-Hour Administrator William McComb, have been unsuccessful in providing one which is non-discriminatory and also carries out the intent of Congress.

Mr. McComb is convinced that Congress must act before the competitive inequities resulting from wording of those sections of the Act involving the "area of production" can be remedied.

Limit Government Competition

House Government Operations Committee has rejected a bid by business to have an anti-government competition board established, but it did approve a substitute measure directing the President to make an annual report to Congress on progress made in ending the government's commercial-type operations. This plan was later passed by the House.

The bill specifies that the Secretary of Commerce must examine complaints of government competition with private enterprise, and again urges all agencies to end "unnecessary" commercial operations.

NEW-TYPE POST OFFICE vehicles, painted red, white and blue for both patriotic and practical reasons, are inspected by Postmaster General Arthur E. Summerfield (left) and Deputy Postmaster General Charles R. Hook, Jr.

Aerial view of the Kansas City, Kansas, Works, Fairbanks, Morse & Co., 3601 Kansas Avenue.

...from Kansas City

Yes, from our new, modern-as-tomorrow works at Kansas City, we serve the world's needs for pumps.

As a major supplier of quality pumping equipment, it is particularly suitable that this new Fairbanks-Morse plant be located at an important crossroads of the world . . . Kansas City. In this new plant 190,000 square feet of manufacturing space and a complete foundry occupying 150,000 square feet are devoted to bringing better service to our customers all over the world.

Modern manufacturing, development and testing equipment backed by engineering and production skills of highly trained personnel combine to produce products of unmatched quality . . . in performance, durability, economy. Fairbanks, Morse & Co., Chicago 5, Illinois.

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Electronics Manufacturing Booms

Business volume expected to hit $750 million on West Coast this year . . . Aircraft demand is source of huge expansion . . . May assemble Packards in Los Angeles—By *R. R. Kay.*

Electronics manufacturing on the West Coast is big business—an estimated $750 million worth this year. And it's growing steadily.

Ramo-Wooldridge Corp. just broke ground in Los Angeles for a $1.75 million facility. Hoxman Radio Corp. is going to build a 200,000 sq ft TV manufacturing plant in the Los Angeles area. General Dynamics' Convair Div. in San Diego sent out an urgent call for 400 electronics engineers and technicians. New factory buildings and additions are constantly announced.

Why They Grew . . . Principal reason for this tremendous growth in such a short time (pre-World War II $25 million annually) is hugely stepped-up use of electronics by the airframe manufacturers. And so, you find electronics manufacturers concentrated in southern California, hard by their customers.

This does not mean electronics manufacturing is 100 pct military. Some companies, large and small, make industrial and consumer products. For example, 20 pct of TV sets bought in the West are made in the West.

Some 165 companies, employing 50,000, do about 90 pct of the electronics business. Hughes Aircraft, now almost 100 pct in electronics, is the largest, with 14,000 on the payroll. Best estimates are that airframe producers employ 5000 more in electronics research, development, manufacturing, and installation.

Outlook Is Bright . . . With soaring Defense Dept. needs for electronics and guided missiles, applications of electronics systems in business and industry, broadening interest in audio devices and improved sound reproducing apparatus, and prospects for increased production of TV sets, the West Coast electronics future is bright.

What does this mean to the West Coast metalworking industry? A purchasing agent for a major electronics manufacturer put it this way: "For our military business we buy lots of aluminum sheet, and some beryllium copper, as our products end up in planes and missiles where weight is a factor. For our commercial products, 95 pct of our purchases are cold-rolled steel sheet in 16, 18, and 20 gage. We buy aluminum castings. We're heavy buyers of sheet metal tools and diecasting dies, too."

"Little Detroit" . . . Assembling Packards for the first time in Los Angeles is a possibility if the stockholders ratify the pending Packard-Studebaker merger. Studebaker's 320,000 sq ft plant can be expanded to assemble Packards for the West Coast market.

Ford's Lincoln-Mercury Div. is spending a half million dollars to improve production facilities at its Los Angeles assembly plant. The program, scheduled for spring completion, includes a 70,000 sq ft addition to the main assembly building.

Willys' 135,000 sq ft assembly plant in Maywood (Los Angeles area) is closed and up for sale, with a layoff of 350 employees. Operations are being shifted to Kaiser Motors' Toledo and Shadyside, Ohio, plants.

Nash, in El Segundo, Calif., is shutting up shop "for an indefinite period."

Startling Developments . . . Full impact of the estimated $3.5 billion spent every year on research should be felt in the next decade or two. Startling new developments in metals, plastics, and chemistry will follow wave after wave of technological innovation, providing long-run prospects for business expansion and industrial progress.

This is what Dr. Robert D. Calkins, president, Brookings Institution, told 400 West Coast executives at a Stanford Graduate School of Business conference. "Businessmen, now as never before, must be conditioned to technological change and new responsibilities. Pioneering and adaptability have become vital requirements for business and national survival," Mr. Calkins said.

A 6-year Brookings study revealed diversification and the changing character of company products are the main factors in keeping top companies on top. Otherwise, the top spot is a slippery place.

"New companies acquire growth by getting into new fields, new products, and by expanding into new areas," Calkins showed. Only 32 companies that were in the top 100 firms in 1909 remained there through 1948.

"Oh, go ahead, have some—nothing would dare disagree with you."

. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS

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New Tool Orders Take Sudden Jump

Index hits highest point since October . . . Source hard to trace but automotive demand a definite factor . . . Jones & Lamson starts leasing plan—By *E. J. Egan, Jr.*

New orders for machine tools in June snapped the overall downtrend that began last September, and pushed the industry's index figure up to 186.8. This was the highest point reached since October, 1953, when the new order index stood at 198.7.

Suddenness and magnitude of the new order gain for June is indicated by the fact that it is 47.3 index points above the final May mark of 139.5. In dollars, June new business would be about $14 to $16 million over the previous month's volume of approximately $41 million.

Can't Trace Orders . . . Source of this quick boom in new orders is difficult to determine. Defense business is certainly not in the picture to any considerable extent. Prime customer group still appears to be the automotive industry.

Although major tooling programs for 1955 cars are completed, some machine tool buying is always underway in the auto plants. Intense competition keeps carmaker's production experts alert to any new machining equipment.

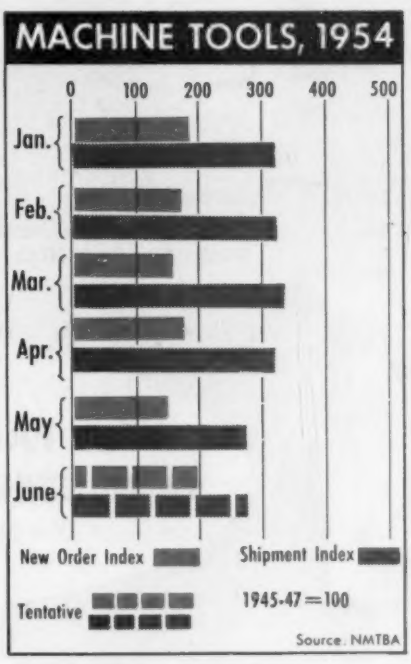
New machine tool orders from foreign sources turned up only slightly in June. National Machine Tool Builders' Assn. reports its preliminary index for June at 15.5, a gain of 3.6 points over the May mark of 11.9. Best month for foreign business in 1954 to date was March, when this index tipped 24.9.

Shipments Up Slightly . . . NMTBA's preliminary index of machine tool shipments for June hit 277.8, a 7.5 point advance over the May figure of 270.3. Shipments are still at a low rate compared with earlier 1954 and 1953 monthly totals, will take a while longer before they begin to reflect the June boost in new orders.

Estimated backlog for machine tool builders is pegged at 3½ months on NMTBA's industry report for June. According to association officials this estimate is apt to be slightly misleading since the sudden extra weight of June new orders is not fully reflected in backlog statistics. Actual backlog would be more like 5 to 6 months, it is claimed.

Starts Leasing Plan . . . Newest major entry in the machine tool leasing field is Jones & Lamson Machine Co., Springfield, Vt.

Four "true lease" plans are now offered machine tool users by J & L in cooperation with C. I. T. Corp., industrial financing firm. Aim is to assist manufacturers needing new equipment who may be short of working capital, or who can invest capital more profitably elsewhere.



Principal differences among the four lease plans involve annual rental and return charges. Each plan requires a 10 pct deposit which is refunded to the customer.

Fully Deductible . . . The "true lease" concept implies that all machine rental payments are fully deductible for income tax purposes. J & L's plans in this category extend up to 9 years and include no option to purchase, either at a stated time or a fixed price. The user can offer to buy the equipment for a fair market price at any time during the lease period. But he is not obligated to do so, nor is J & L obligated to sell.

Leased machines will carry the usual one-year guarantee. And users can terminate leases at the end of any year.

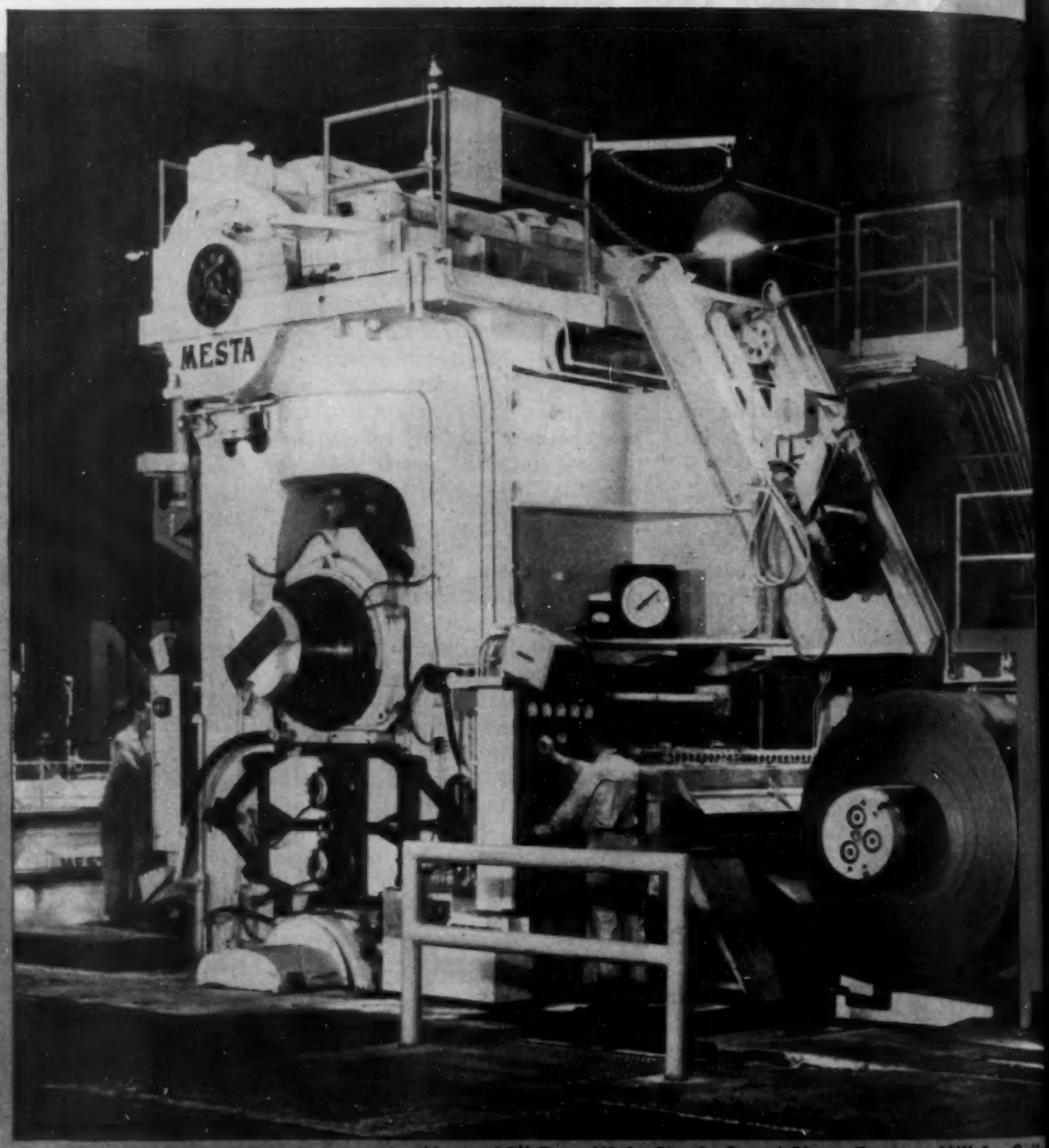
Offer Another Plan . . . The cooperating companies also offer lease plans which do give the customer an option to buy the equipment for a fixed price at the end of any lease year. Difference between these arrangements and the "true lease" plans is that rental payments would not be deductible from income tax returns.

As an alternative to either type of leasing agreements, the J & L-C.I.T. merchandising program includes an installment financing plan with 5-year terms. This calls for a down payment of 25 pct of the purchase price with the balance payable to C.I.T. in up to 60 monthly installments.

Carbide Tools . . . Condensed five-day training courses in the design and application of cemented carbide tools are being conducted nearly every week by Carboloy Dept., General Electric Co., Detroit. Sessions are open to all individuals interested in carbide uses.

Lectures and laboratory sessions cover brazing, design, grinding, chip breakers, rates of operation, interrupted cutting, reamers, trepanning, gun drilling, milling, machinability and tool control.

High-Speed COLD MILLS



Mesta 80" Four-High, Single-Stand Sheet Temper Mill for Coils

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Metal Cleaning Finishing Handbook

The Iron Age
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Special Feature

TABLE 1 SPOT TEST IDENTIFICATION OF METAL SURFACES

SEQUENCE "A"

Sequence "A" is for testing white metals when it is not certain whether they are surface treated or not

Place a drop of the specified solution on the metal for 0.5 min.

1. Hot 20 pct NaOH

- Violent Reaction (May Be Al) → Add Nitric Acid → No Reaction → **ALUMINUM**
- Slight Reaction (May Be Zn) → Add Nitric Acid → Colorless Reaction → **ZINC**
- No Reaction → Proceed to (2)

2. Concentrated HCl and transfer the reaction product to a filter paper and add a drop of a solution of 2.7 oz H_2SO_4 1.3 oz Potassium Ferricyanide Per Gal of Water

- Blue Spot → Iron Content and Test for Nickel and Chromium → **STAINLESS STEEL**

3. Concentrated HCl and Colorless or Red Reaction. Transfer the reaction product to a filter paper and add an excess of Ammonia

- Blue Reaction → Copper Content (Test for Nickel) → **MONEL or WHITE BRASS**

4. 20 pct HF

- Yellow Reaction → (Check for Silver) → **SILVER**
- Slight Reaction → **MAGNESIUM**

SEQUENCE "B"

Sequence "B" is for testing white plated surfaces

Place a drop of the specified solution on the metal for 0.5 min.

1. Concentrated HCl, Green Reaction. Transfer reaction product to a filter paper and add Ammonia and Dimethglyoxime

- Colorless Spot → **CHROMIUM**
- Red-Pink Spot → **NICKEL**

2. Concentrated HCl, Colorless Reaction. Transfer reaction product to a filter paper and treat the reverse side of the paper with powdered Cacotheline

- Violet Spot → **TIN**

3. No Color From Test (2), then place a drop of Concentrated HNO_3 and transfer reaction to a filter paper and add Ammonia and Sodium-Sulfide

- White Spot → **ZINC**
- Yellow Spot → **CADMIUM**

4. Brown or Black Reaction in Test (3), then transfer the reaction product to a filter paper and add NaOH

- White Spot → **LEAD**
- Brown-Black Spot → **SILVER**

5. Concentrated Aqua Regia

- No Reaction → **RHODIUM**
- Dissolves → **PLATINUM**

Concentrated Nitric Acid will effect neither

SEQUENCE "C"

Sequence "C" is for yellow and colored metal surfaces

Apply an open flame to the "colored" metal surface

- Carbonized or Softened → **LACQUERED or PAINTED**

To Uneffected Surface Add a Drop of Concentrated HNO_3

- No Reaction → **GOLD**
- Blue Reaction → **COPPER or BRASS**
- Violent Reaction (Colorless) → **DYED or TREATED MAGNESIUM**
- Color Faded (But No Reaction on Metal) → **DYED or TREATED ALUMINUM**

Surface Treating

TABLE 2 — **PHOSPHATE SURFACE TREATMENTS**

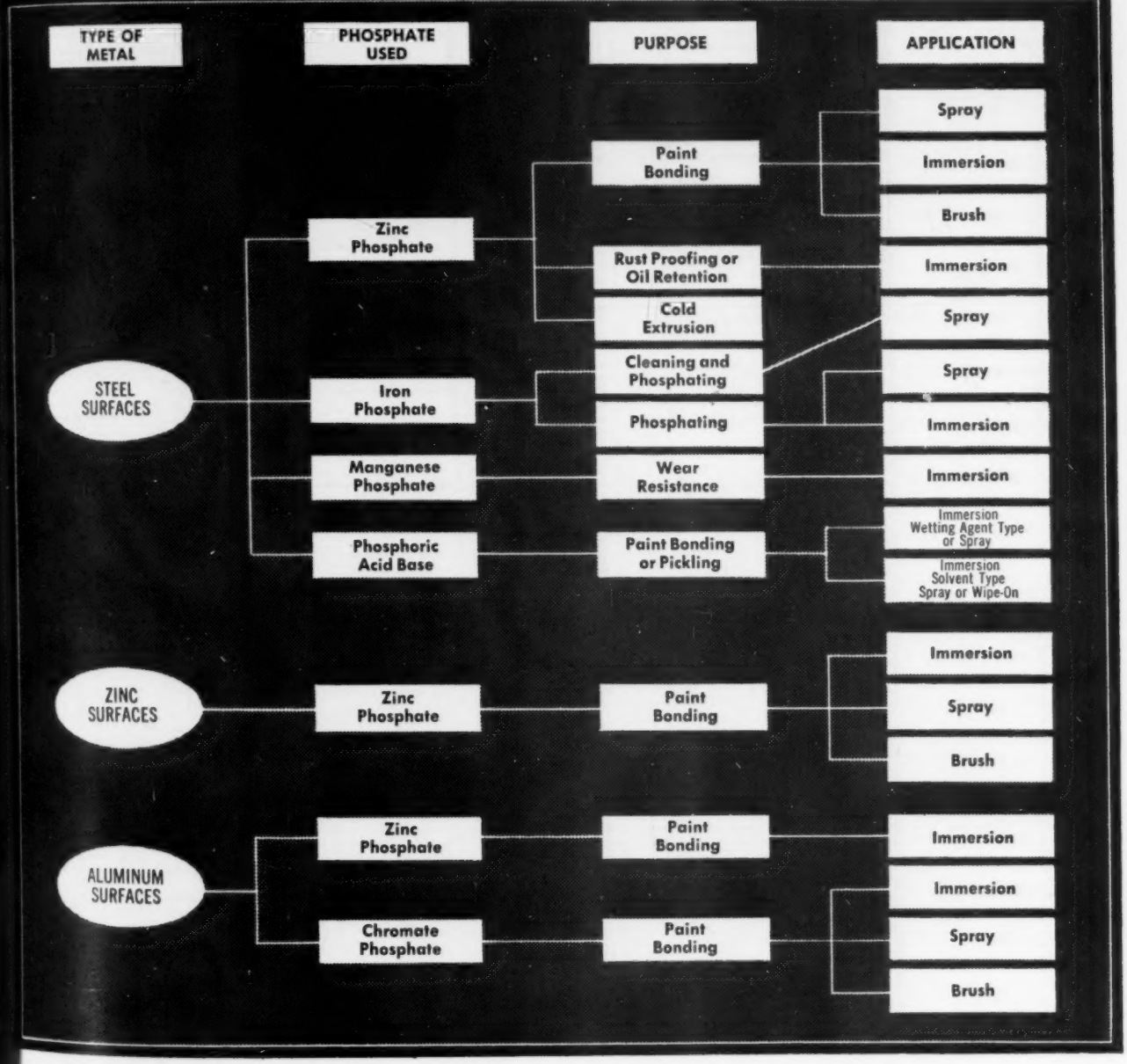


TABLE 3

SURFACE TREATMENTS OF ALUMINUM ALLOYS

TREATMENT	Purpose	For Use On	Manufacturer	Operation	Thickness and 20 Pct Salt Spray Resistance
ALODINE	Corrosion resistance and for paint base		American Chemical Paint Co.	1 to 2 min immersion at 115°F	
ALROK	Corrosion resistance and for a paint base	Best results on non heat-treatable alloys; assemblies with steel may be treated	Aluminum Co. of America	10 to 30 min immersion at 180°F to 200°F, steel tank	No dimensional change, 250 hr or more on non heat-treated alloys
ALUMILITING (Anodizing)	Corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings	Aluminum Co. of America	15 to 60 min, 12 amp per sq ft, 24 v dc, 70°F, 90°F, lead tank and cathode, aluminum racks	0.0002 to 0.0008-in. coat about one-third of which is dimensional change, 250 to 1000 hr
ALUMINUM (Immersion coloring)	For paint base for blackening, etc.	All alloys and assemblies may be treated; limited range of colors; for identification purposes	Colonial Alloys Co.	Two immersion baths, one at room temperature and one at elevated temperature	No abrasion resistance, no dimensional change, 25 to 50 hr salt spray resistance
ALUMON (Electroplating process)	For plating on other metals, for soldering, decorative purposes, hardness, etc.	Any metal may be plated direct, preferably nickel first	Enthone Corp.	Immersion in a solution at room temperature as preparation before plating	Thicknesses same as on steel
CHEMOXIDING	Corrosion resistance and for a paint base	Best results on non heat-treatable alloys; assemblies with steel may be treated	Colonial Alloys Co.	3 to 10 min immersion at 180°F to 200°F, steel tank	No dimensional change, 250 hr or more on non heat-treated alloys
CHROME-ALUM (Electroplating process)	For plating on other metals for soldering, decorative purposes, hardness, etc.	Assemblies of other alloys and assemblies of aluminum cannot be treated	Chrome-Alum Corp.	Oxalic acid anodize, and modify coat and nickel plate	Thicknesses same as on steel
CHROMIC ACID (Anodizing)	High corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings; not as abrasive resistant; longer time required for dyeing	Not proprietary; 5 to 10 pct chromic acid by weight	30 to 90 min, 1 to 3 amp per sq ft, 40 v dc, 95°F, steel tanks and cathode, aluminum racks	0.00001 to 0.00008 in., 250 hr and up
EC ANODIZING	High corrosion resistance and high speed coloring	Wide color range, low cost, quality process	Colonial Alloys Co.	4 min electrolytic	
ELECTRODIZING (Anodizing)	Corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings	Colonial Alloys Co.	10 to 35 min, 12 to 24 amp per sq ft, 20 to 30 v ac, 80° to 100°F; work acts as anode and cathode, insulated tank, aluminum racks	0.0002 to 0.0008-in. coat, about one-third of which is dimensional change, 250 to 1000 hr
IRIDITE	Corrosion resistance and paint base. Base for adhesive bond	All alloys and assemblies. Natural, gold to brown. Dye colors for identification. Coatings are electrically conductive	Allied Research Products	10 sec to 6 min at room temperature, single dip for basic coatings; film thickness, a function of immersion time, double dip for dyes	No dimensional changes 150 to 2000 hr depending on alloy and coating thickness
PHOSPHATE COATING	Paint base	No abrasion resistance, only a little corrosion resistance; for paint adhesion	American Chemical Paint Co.; Detrex Corp.; Neilson Chemical Co.; Oakite Products Co.; Parker Rust Proof Co.; Pennsylvania Salt Mfg. Co., etc.	3 to 5 min immersion at 180° to 200°F	No appreciable thickness, no appreciable salt spray increase
PREPLATING PROCESS (Electroplating)	For plating on other metals, for soldering, decorative purposes, hardness, etc.	Any metal may be plated direct	Colonial Alloys Co.	Immersion in a solution at room temperature as preparation before plating	Thicknesses same as on steel
VACUUM IMPREGNATION	For castings; to fill up pores of castings to withstand pressure	Limited to castings	Interchemical Corp.; Bakelite Corp.; DuPont Co., and others	Castings are impregnated with specific lacquers in a vacuum	Not appreciable, no appreciable salt spray increase
VACUUM PLATING	Very bright platings	No limitations	Non-proprietary (except equipment)	Lacquer coat, vacuum metallize with aluminum, then lacquer coat again	0.001-0.002 in.

Table Courtesy Colonial Alloys Co., Philadelphia.

TABLE 4 — CHEMICAL TREATMENTS FOR MAGNESIUM ALLOYS

Dow no.	treatment		specification (1)		alloys on which treatment may be used	appearance	approx. no. of steps including rinses	approx. total time in treating baths minutes	uses	remarks
	name	type	MIL Aero	AMS						
1	Chrome-Pickle	chemical	MIL-M-3171 type 1	2475	all alloys	matte gray to yellow red	5	6	general purpose treatment applied to practically all forms of magnesium for protection during shipment and storage. good paint base.	simple dip treatment, usually the cheapest to apply. etching action causes slight dimensional loss.
4	Chrome-Alum	chemical	—	—	die cast R	brown-black	6	10	used only as a black decorative finish for die castings.	offers some improvement in adhesion of paint.
7	Dichro-mate	chemical	MIL-M-3171 type 3	2475	all aluminum containing alloys and ZK60A. cannot be used on Dowmetal M	brown	7	45	provides best combination of paint base and protective qualities.	does not materially affect dimensions. requires ½ hour or more in boiling solution.
8	Alkaline Dichro-mate	chemical	—	—	all aluminum containing alloys and ZK60A. cannot be used on Dowmetal M	brown-black	9	45	used for black finish on all forms. more protective on die castings than #4.	has protective and paint base qualities. requires boiling in solution ½ hour or more.
9	Galvanic Anodize	electro-chemical	MIL-M-3171 type 4	—	all alloys	black	7	30	used on Dowmetal M in place of #7 or #3. also any other non-aluminum-containing alloys not treatable in #7 or #8.	requires galvanic couple between work and steel tank or steel cathode plates if tank is ceramic lined.
10	Sealed Chrome-Pickle	chemical	MIL-M-3171 type 2	—	all alloys	similar to #1.	7	35	alternate for #7 when dimensional loss can be tolerated.	improved protection over #1 due to boiling 30 minutes in dichromate solution.
12	Caustic Anodize	electro-chemical	—	—	all alloys	light shades of gray and tan.	5 to 8	30	specialty treatment combining decorative finish with abrasion resistance and protective value.	can be dyed. neutralizing seal gives it paint base qualities equal to #7 treatment.
14	a-c Anodic	electro-chemical	—	—	all alloys	light gray to white	4 to 7	25	most abrasion resistant of the chemical treatments. when given a neutralizing seal can be painted. cannot be dyed.	will cover flow marks in die cast surface. should be waxed to prevent smudging.
15	Bright Finish for wrought products	chemical	—	—	Dowmetals FS1, J1, M, O1 and ZK60A.	silvery	5 to 7	10	decorative finish. used only on wrought magnesium.	good "shelf life" appearance. dimensions slightly affected by treatment.
16	Bright Finish for castings	chemical	—	—	Dowmetals C, H, R and AZ91C	silvery	4 to 7	7	decorative finish. used only on magnesium castings.	appearance similar to No. 15, good "shelf life" appearance. slight effect on dimensions.

(1) MIL Aero — Military Aeronautical Standards.
AMS — Aircraft Material Specifications of the S. A. E.

Table Courtesy THE DOW CHEMICAL CO., Midland, Mich.

TABLE 5

CHEMICAL CONVERSION COATINGS

U. S. Government Specifications

SPECIFICATION NO.	TITLE	TYPE COATING	REQUIREMENTS	APPLICATIONS
ARMY-NAVY AN-C-170	Chemical films for aluminum	Oxides, phosphates, chromates	Salt spray test, 500 hr min	Paint-base and corrosion preventive film
AN-QQ-A-696	Anodic films; corrosion protection for aluminum	Oxide	Salt spray test, 250 hr min, continuous, free from breaks	Paint-base and corrosion preventive film
FEDERAL QQ-P-416	Chromate finish on cadmium	Chromate	Salt spray test	Paint-base and corrosion preventive film on ferrous materials
Cl. A		0.0005″ min	96 hr white salts; 336 hr red rust	
Cl. B		0.003″ min	96 hr white salts; 228 hr red rust	
Cl. C		0.002″ min	96 hr white salts; 192 hr red rust	
JOINT ARMY-NAVY JAN-C-490	Cleaning and preparation of ferrous metal surfaces for organic protective coatings			
Gr. 1		Phosphate	Adherent, crystalline film	Preparation prior to organic coat
MILITARY MIL-C-5541	Chemical films for aluminum	Oxides, phosphates, chromates	Salt spray test, 500 hr min	Paint-base and corrosion protective film
MIL-C-12968	Coatings, phosphate protective for iron and steel			
Type A		Manganese phosphate	1500 mg/sq ft, 1-hr salt spray	With supplementary petroleum base finish or as a paint base
Type B Cl. 1		Zinc phosphate	1000 mg/sq ft, 2-hr salt spray	With supplementary petroleum base finish or as a paint base
Type B Cl. 2		Zinc phosphate with inorganic salt seal	1000 mg/sq ft, 24 hr salt spray sealed, 40 hr salt spray sealed and dyed	With dyed or supplementary finish for fire control instruments
MIL-C-16232 Type I	Coatings, phosphates	Phosphate, 0.00020–0.00040 in. thick	Salt spray, 1.5 hr without impregnation, 24 hr with impregnation	On bearing surfaces (must be impregnated with oil)
Type II		Phosphate, 0.00020–0.00050 in. thick	Salt spray, 2 hr without impregnation, 48 hr with impregnation	On moving parts (must be impregnated with rust preventive)
MIL-M-3171	Process for corrosion protection of magnesium alloys		Subject to inspection and salt spray tests	Paint-base and corrosion protective films on magnesium alloys
Type I	Chrome pickle	Chromates		
Type II	Sealed chrome pickle	Chromates		
Type III	Dichromate	Chromate		
Type IV	Galvanic anodizing	Oxide		
MIL-T-12879	Chemical treatments for zinc surfaces		Subject to inspection	Paint-base and corrosion protective film
Type I, Cl. 1	Prepaint	Phosphate		
Cl. 2	Prepaint	Chromate		
Type II	Final finish	Chromate		
ARMY USA 50-80-11A	Chromate finish on zinc	Chromate	Unpainted salt spray test, 24 hr min	Paint-base and corrosion protective film
USA 57-0-2C	Finish, black oxide, phosphate and chromate			
Type II, Cl. A		Phosphate, finished with non-drying petroleum oils	Salt spray, 1 hr before and 24 hr after supplementary finish	Sliding or bearing surfaces
Cl. A-1		Phosphate, finished with non-drying petroleum oils	1 hr before and 24 hr after supplementary finish	Sliding or bearing surfaces
Cl. B		Phosphate, finished with rust preventive	2 hr before and 36 hr after supplementary finish	Non-moving parts
Cl. C		Phosphate, finished with paint	No salt spray test before, 250 hr after supplementary finish	None specified
Type III, Cl. A, Gr. 1		Oxides, finished with non-drying petroleum oils	Salt spray, 1 hr before, 2 hr after supplementary finish	None specified
Cl. A, Gr. 2		Oxides, finished with rust inhibitive lacquer	Salt spray, ½ hr before, 16 hr after supplementary finish	None specified
Cl. A, Gr. 3		Oxides, finished with rust inhibitive lacquer	Salt spray, ½ hr before, 24 hr after supplementary finish	None specified
Cl. B		Chromate	Salt spray, ½ hr before, 24 hr after supplementary finish	None specified
Cl. C		Oxide (fused salt)	Salt spray, ½ hr before, 24 hr after supplementary finish	None specified
ASTM B-201-49T	Chromate finishes on electrodeposited zinc, hot-dipped, galvanized, and zinc die cast surfaces	Chromate	Salt spray, 24 hr min	None specified

Compiled by N. E. Woldman, Upper Montclair, N. J.

TABLE 6

METAL CONDITIONING (SURFACE CLEANING)

U. S. Government Specifications

SPECIFICATION NO.	TITLE	MATERIAL	APPLICATION METHODS	PHYSICAL REQUIREMENTS	PURPOSE
ARMY USA 3-213 Type I	Preparation of surfaces (Wash-off)	Phosphoric acid 3 water, 1 acid	Spray, brush, immerse	(Homogeneity, flash point, sedimentation, toxicity, acid content)	Aircraft frames and parts
Type II	(Wipe-off)	3 water, 1 acid	Brush, sponge		Aircraft frames and parts
Type III	(Inhibited)	2 water, 1 acid	Spray, brush, immerse		Chromium plated surfaces and close tolerances
FEDERAL P-R-791	Rust removing compound	Phosphoric acid base (not less than 5% free acid)	Immersion	Clear liquid, flash point, 135° F, no injurious fumes or vapors	Removal of rust from ferrous surfaces in presence of light grease and oil
JOINT ARMY-NAVY JAN-C-490 Gr. II	Cleaning and preparation of ferrous metal surfaces for organic protective coating	Phosphoric acid base (solvent)	Immersion	None required	Preparation of surface
Type I		Abrasive shot, sand, grit or seed	Mechanical blasting		
Type II		Hot alkali	Immersion, spray or electro-clean		
Type III		Solvent	Immersion, spray or vapor degrease		
Type IV		Alcoholic phosphoric acid	Immersion		
Type V		Hot phosphoric acid plus detergent	Immersion		
Type VI		Emulsion cleaners	Immersion		
MILITARY MIL-C-5410	Cleaning and preparing aluminum surfaces	Phosphoric acid base			On aluminum surfaces of aircraft
Type I		Standard	Brush, spray	Non-inflammable, clear	
Type II		Concentrate	Brush, spray	3-months weather test	
MIL-C-15205 (ships)	Cleaning, preparation, surface treatment and conditioner	Petroleum derivatives, free from added kerosene or essential oils			
Type I		Light	Spray or hand brush	Flash pt 280° F min, viscosity 100–120 @ 100° F	
Type II		Heavy	Spray or hand brush	Flash pt 315° F min, viscosity 300–370 @ 100° F	
MIL-M-10578	Preparation of surfaces	Phosphoric acid		(Homogeneity, flash point, sedimentation, toxicity, acid content)	
Type I	(Wash-off)	3 water, 1 acid	Spray, brush, immerse		Clean
Type II	(Wipe-off)	3 water, 1 acid	Brush, sponge		Clean
Type III	(Inhibited)	2 water, 1 acid	Spray, brush, immerse		Chromium plated surfaces and close tolerance surfaces

Compiled by N. E. Woldman, Upper Montclair, N. J.

Cleaning and Pickling

TABLE 7 TYPICAL ELECTROLYTIC CLEANING OPERATIONS

METAL	TYPICAL ELECTROLYTE (Per Gal of Water)	VOLTS	CURRENT DENSITY AMP PER SQ FT	TEMPERATURE °F	TREATMENT TIME, IN MIN	OPERATING DATA
BRASS	Mild alkaline solution	7	2	200	2	Cathodic, steel anode, and tank
BRASS (to be nickel plated)	4 oz sodium carbonate 2 oz tri-sodium phosphate 12 oz sodium phosphate 1 oz caustic soda	6 to 12	high	175 to 200	Few seconds	Cathodic, steel anode, and tank
LEAD OR TIN	4 oz sodium carbonate and little tri-sodium phosphate	4	10	200 212	1 to 3	Cathodic, steel anode and tank, dip in HCl solution and NaCl
MAGNESIUM	250 g per liter chromic acid 150 g per liter sulphuric acid	6	150 to 500	113	Few seconds	Cathodic, lead anode and tank
MAGNESIUM	25 pct hydrofluoric acid	45	400	Room	10	Cathodic, lead anode and tank
MAGNESIUM	3 oz sodium carbonate 2 oz sodium hydroxide	6	10 to 40	190 212	3 to 10	Cathodic, steel anode and tank
NICKEL	2 oz sodium carbonate 5 oz sodium sesquisilicate 0.5 oz caustic soda	6	15	210	1/12 to ½	Cathodic, lead anode and tank, follow by 2 pct sulphuric acid dip
NICKEL	2 oz sodium carbonate	6	10	120	1/12 to ½	Cathodic, lead anode and tank, follow by 2 pct sulphuric acid dip
NICKEL	Patent No. 2, 299, 054 Sodium cyanide					Cathodic
STEEL	3 oz caustic soda	6	10	145	1 to 4 anodic ¼ cathodic	Agitate work, steel cathode
STEEL	4 to 8 oz caustic soda	1	20 to 60	180 200	¼ up	Agitate work, steel cathode
STEEL	4 oz sodium carbonate 2 oz tri-sodium phosphate 1 oz caustic soda	6 to 12	50 to 60	170 to 200	½ up	Steel anode, brazed copper bars
STEEL	5 oz sodium sesquisilicate 0.5 oz caustic soda	6 to 12		210	1 to 5	Anodic
ZINC	0.5 oz tri-sodium phosphate 1.2 oz sodium carbonate	6		160 180	½ to 2	Cathodic, follow by dip in 200 g per liter chromic acid at 212° F
ZINC	4 oz sodium cyanide 2 oz caustic soda 1 oz sodium dichromate	2	20 to 40		15 to 35	Use wetting agent, reverse current

Table courtesy COLONIAL ALLOYS CO., Philadelphia.

TABLE 8 COMPARISONS OF PICKLING, DEGREASING, CLEANING AND DESCALING

FACTORS	Tumbling	Sand and Shot Blasting	Flame Cleaning	Safety Solvent Degreasing	Chlorinated Solvent Degreasing	Emulsifiable Solvent Degreasing	Chemical and Electro-Chemical Cleaning	Immersion and Electro-Pickling	Scratch Brushing	Catalyzed Salt Cleaning (Kolene)	Sodium Hydride Descaling (Du Pont)	Virgo Salt Descaling (Hooker)
EQUIPMENT	Horizontal or tilting barrel—20 to 60 rpm	Air blasting, etc., or centrifugal wheels	Oxyacetylene multiflame torches	Tanks and/or conveying and spraying equipment	Special vapor-phase degreasing machines	Same as for safety solvents and heat	Revolving barrels may be used (drums)	Tanks, acid lined	Hand brushes or polishing lathes	Heated tank Water rinses D. C.	Salt bath furnace Acid tubs Ammonia dissociator	Fused salt bath, tanks, conveying equipment
MEDIUM (solution or materials)	Steel balls, stars, slugs, or chemicals and soaps	Sand or grit or shot	Oxyacetylene multiflame torches	Mineral solvents with flash point over 100° F	Tri-or per chlorethylene or equal	Mineral solvent mixed with suitable detergents, etc., followed by a hot water treatment.	Generally alkaline solutions	Various acids; see pickling table VIII	Hand brush-polishing lathes; see scratch brush table XVII	Proprietory Catalyzed Salt Compound	Fused caustic soda containing 1.5–2.0% Sodium Hydride. Acid solutions for after treatments	Fused salt, water quench, acid dip
SIZE AND SHAPE LIMITATION	Maximum 10-lb pieces. No interstices	Generally castings all sizes except smallest—not used after machining	No thin sections; only for large work	All shapes and sizes	Volume of small parts	All shapes and sizes			Small parts, not for production	All shapes and sizes Iron and steel	All shapes and sizes	
USUAL SUBSEQUENT OPERATION	Plate after pickling Painting		Painting	Painting or pickling or chemical cleaning, polishing, etc.			Plating Painting	Alkaline cleaning	Painting Polishing	Machining Brazing Tinning, polishing Coating	Further processing Fabrication Finishing	Further fabricating
SURFACE AND METAL EFFECTS	Stress relief may occur. Removes dirt and scale. Dimensional changes.		Removes dirt and scale	No change to metal or surface. Removes oils, greases, and removes solid-particle dirt if loosely held.			Removes dirt, vegetable, and animal oils	Removes oxides and scale		Removes sand, scale and other oxides. Carbon, graphite, oils, etc.	Removes dirt and scale	Removes oxides, scale dirt, carbon silicon, etc.
OPERATING TEMPERATURES	Room, chemical barrel clearing at elevated temperatures	Room	Extremely high temperature	Room to 250° F	188° F usually	Room, followed by hot water at 200° F	Generally 140° to 200° F	Room to 180° F	Room	825° to 975° F	700° to 775° F	800° to 1250° F
HEALTH HAZARDS	Safe	Precautions required	None	Slight	Care required	Slight to none	Slight to considerable	Considerable	Slight	Precautions required	Care required	Precautions required
FIRE SAFETY HAZARDS, ETC.	Safe	None	As hazardous as welding	Fairly safe	Very slight	Fairly safe	None	None	None	Safe with proper precautions	Similar to other molten baths	None
TYPE OF WORKMEN	Semiskilled	Semiskilled	Semiskilled	Unskilled	Semiskilled	Unskilled	Unskilled	Unskilled	Unskilled	Semiskilled	Semiskilled	Unskilled
MECHANICAL CLEANLINESS (i. e. oxide and scale removed)	Yes	Yes	Yes	No	No	No	No	Yes if not too heavy	Yes	Yes	Yes	Yes
PHYSICAL CLEANLINESS (Oil and grease and solid particle dirt removal)	No	Yes	Yes	Yes	Yes	Yes	Yes, except mineral oils	No	No	Yes	Yes	Yes
CHEMICAL CLEANLINESS (all soils and dirt and chemicals—finger prints)	Mostly	Mostly	No	No	No	No	Yes	No	Mostly	Yes	Yes	Yes
SUBSEQUENT OXIDATION	Yes*	Yes*	Yes*	No	Yes*	No	Yes*	Yes*	Yes*	Same as base metal	Carbon steel—yes Stainless steel—no	No

TABLE 9 TYPICAL ACID PICKLING AND BRIGHT TIP TREATMENTS

METAL	*BATH	TEMPERATURE, °F	TREATMENT TIME, Min	APPLICATION
ALUMINUM	Nitric acid solution (10 pct to 50 pct)	Room	1 to 3	Removing smut after alkali dips
ALUMINUM	3 to 8 parts nitric acid and 1 part hydrofluoric acid	Room	½ to 3	Removing smut after alkali dips and brightening diecastings
ALUMINUM	Various proprietary acid compounds—water	At room, or elevated	1 to 3	Still baths and agitated baths for pickling and deoxidizing
HIGH BRASS	9 pct sulphuric acid and 5 pct citric acid	140	2	Brightener
HIGH BRASS	54 oz sulphuric, 9 oz nitric, ¼ oz hydrochloric acids with 60 oz of water	Room	1 to 10	Brightener
HIGH BRASS	5 pct sulphuric acid, followed by a dip in 10 pct to 15 pct chromic acid	140 to 150	3 to 5	Brightener
LOW BRASS	9 pct sulphuric acid, 1 pct cream of tartar and 1 gal of water	125	2	Brightener
LOW BRASS	1 gal sulphuric acid, 2 gal water and 8 lb Bryt Dip (proprietary)	Room	1 to 6	Brightener
CHROMIUM	18 pct hydrochloric acid	Room	1 to 3	Brightener
COPPER AND ALLOYS	1 gal sulphuric acid and 4 gal water	150 to 180	1 to 60	Removal of scale
COPPER AND ALLOYS	2 gal sulphuric, 1 gal nitric acid, 2 lb zinc sulphate, 1 gal water	100	1 to 5	Excess of sulphuric "coarsens" Excess of nitric "smoothens"
COPPER AND ALLOYS	2 gal sulphuric, 1 gal nitric acid, and 5 gal of water	Room	1 to 10	Removal of scale
IRON	6 pct to 8 pct sulphuric and ½ pct hydrofluoric acid and 1 gal of water	160 to 180	5 to 15	Removal of sand and "fire-off" scale
IRON	1.5 pct to 3 pct hydrofluoric acid, 12 pct ferric sulphate—1 gal of water	160 to 180	5 to 15	Removal of sand and "fire-off" scale
IRON	20 pct hydrochloric and 20 pct hydrofluoric and 5 to 15 pct sulphuric acid and water	120 to 180	5 to 20	Removal of sand and "fire-off" scale
MAGNESIUM	15 pct to 30 pct chromic acid by weight 1 pct sodium trifluoride (Avers patent)	120 and higher	1 to 10	Oxide removal
MAGNESIUM	10 pct to 15 pct chromic acid by weight ½ pct sulphuric acid	150	5 to 10	Oxide removal
NICKEL-SILVERS	9 pct ferric sulphate, 5 pct adepic acid	160	1	Brightener
NICKEL-SILVERS	2 gal sulphuric, 1 gal nitric, ½ gal hydrochloric acids and 1 gal water	Room	1 to 2	Brightener
NICKEL-SILVERS	2 parts sulphuric, 1 part nitric acids and small quantity of water	Room	1 to 5	Brightener
MONEL	1 gal water, ¾ pint sulphuric acid, ½ lb sodium nitrate, pinch of sodium chloride	180 to 190	30 to 90	Brightener
MONEL	½ lb cupric chloride, 1 gal hydrochloric acid (30° Be), 2 gal water	180	20 to 40	Brightener
MONEL	1 gal sulphuric acid, 1 lb sodium dichromate and 10 gal water	100	5 to 10	Follow pickle with brightener—dip in 12 pct nitric acid
STEEL	50 pct sulphuric or 10 pct hydrochloric acid and water	70 to 90	10 to 20	Pickling 16 gage and under
STEEL	5 pct to 15 pct sulphuric or 7 pct to 20 pct hydrochloric acid	120 to 180	5 to 20	Pickling over 16 gage steel
STEEL	2 pct to 4 pct sulphuric acid, 2 pct to 4 pct ferric sulphate (Ferrisul solution)	160 to 180	10 to 20	Pickling light gages
18-8 STAINLESS STEEL	7–10 lb sulphuric, 12–15 lb nitric and 1½ to 2 lb hydrofluoric acids plus water to make 100 lb (U. S. patent 2,337,062)	.....	.....	Removes scale
18-8 STAINLESS STEEL	6 to 8 parts sulphuric and 2 to 4 parts hydrochloric acids solution with water	140 to 160	2 to 5	Loosens scale
18-8 STAINLESS STEEL	10 to 24 parts sulphuric, 1 to 4 parts hydrochloric with water	130 to 150	2 to 5	Removes scale
18-8 STAINLESS STEEL	6 pct to 12 pct ferric sulphate (ferrisul) 3 pct to 6 pct hydrofluoric acid and water	160 to 180	2 to 5	Removes fire scale
CHROME STAINLESS	10 parts sulphuric acid, 1 lb sodium chloride and water	140 to 160	2 to 5	Loosens scale
CHROME STAINLESS	25 parts hydrochloric and 1 lb nitric acids, 100 parts water	140 to 160	2 to 5	Removes scale
ZINC AND CADMIUM	¼ pct to ½ pct nitric acid, or 13 oz chromic acid with 0.1 oz hydrogen peroxide	Room	1 to 5	Brightener
ZINC AND CADMIUM	6 pct to 12 pct ferric sulphate, ½ pct nitric, 8 pct to 10 pct sulphuric acids and acid tartrate	160 to 180	5 to 15	Brightener
ZINC AND CADMIUM	10 pct nitric, 2 pct sulphuric acids and hydrogen peroxide	Room	1 to 10	Brightener—do not use prior to plating

ELECTROLYTIC PICKLING

METAL	ELECTROLYTE	CURRENT DENSITY, Amp Per Sq Ft	MINUTES	OPERATION
BRASS	Electrolyte same as chrome plating bath	4 to 8	1 to 3	Cathodic, room to 125° F
NICKEL AND ALLOYS	Sulphuric and phosphoric acids and water, varying concentrations	Varying	5 to 15	Anodic at varying temperatures (brightener)
NICKEL-SILVERS	10 pct to 20 pct sulphuric acid	Varying	1 to 10	Reverse current, varying temperatures and follow with dip in sodium cyanide solution
NONFERROUS ALLOYS	Ammonium citrate or 5 pct sodium cyanide	5 to 10	30 sec	Anodic, room to 125° F prior to regular pickling for scouring
FERROUS ALLOYS	75 pct to 80 pct sulphuric acid	1 to 10	1	Anodic, room temperature (brightener)
STEEL	Bullard-Dunn processes: 10 oz sulphuric acid, 0.13 oz tin sulphate, 1 gal water	30 to 80	1 to 10	Cathodic
STEEL AND IRON	Ferrous sulphate (0.4N $FeSo_4$) and 0.3 pct sulphuric acid	8	30	Anodic (brightener)
STEEL AND IRON	Sulphuric acid 47.5 g per liter, 10.3 g per liter hydrochloric acid, sodium chloride 22.5 g per liter, little lead sulphate, and liter H_2O	75	3 to 5	Cathodic (Duriron anode) 150° to 180° F
HIGH-SPEED STEELS	115 g per liter caustic, 15 g per liter citric acid then dip in 6 to 12 normal hydrochloric few seconds	25	1 to 5	Anodic, room temperature (brightener)

Tables courtesy COLONIAL ALLOYS CO., Philadelphia.

TABLE 10

PROPERTIES AND USES OF CHLORINATED SOLVENTS

	CARBON TETRACHLORIDE	ETHYLENE DICHLORIDE	TRICHLOR-ETHYLENE	PERCHLOR-ETHYLENE	PROPYLENE DICHLORIDE	o-DICHLORO-BENZENE	METHYL CHLOROFORM
FORMULA	CCl_4	$ClCH_2.CH_2Cl$	$ClCH:CCl_2$	$Cl_2C:CCl_2$	$CH_3.CHCl.CH_2Cl$	$1,2\text{-}C_6H_4Cl_2$	$CH_3.CCl_3$
MOLECULAR WEIGHT	153.84	98.97	131.40	165.85	112.99	147.01	133.42
BOILING POINT (760 mm.), °C °F	76.75 170.15	83.4 182.1	86.9 188.4	121.2 250.2	96.2 205.2	180.5 356.9	74.1°C (165.4°F)
FREEZING POINT, °C °F	−23.0 −9.4	−35.9 −32.6	−86.4 −123.5	−22.35 −8.2	−100.4 −148.7	−17.0 +1.4	−33.0°C (−27.4°F)
VAPOR PRESSURE (mm. Hg), 20°C	91.1	66.8	57.8	14.4	39.7	1.1	101 mm. Hg at 20°C
SPECIFIC GRAVITY, VAPOR (Air = 1)	5.31	3.48	4.54	5.73	3.90	5.07	4.60
DENSITY, LIQUID (20°/4°C) Pounds/Gallon, 20°C (68°F)	1.594 13.30	1.253 10.45	1.464 12.22	1.623 13.53	1.156 9.65	1.306 10.90	1.327 at 20°/4°C 11.07 (20°C)
SOLUBILITY IN WATER g./100 g. water	0.08 (25°C)	0.84 (25°C)	0.11 (25°C)	0.015 (25°C)	0.27 (20°C)	0.0145 (25°C)	——
SOLUBILITY OF WATER IN SOLVENT g. water/100 g. solvent	0.013 (25°C)	0.16 (20°C)	0.027 (25°C)	0.0105 (25°C)	0.04 (20°C)	——	——
LATENT HEAT OF VAPORIZATION cal./g. (B.P.) B.T.U./lb.	46.8 84.2	77.3 139.1	57.2 103.0	50.0 90.0	67 121	65 117	——
SPECIFIC HEAT, LIQUID, 20°C cal./g./°C or B.T.U./lb./°F	0.205	0.308	0.225	0.205	0.22	0.27	0.275 at 20°C
FLASH POINT (Closed Cup)*, °F	none	56	none	none	60	151	none
MAX. ALLOWABLE CONCENTRATION in Air, parts per million**	25	100	200	200	75	50	500
STABILITY	May be used in the presence or absence of air and light with the common construction metals up to 130°C (266°F). In the presence undissolved water, carbon tetrachloride hydrolyzes readily, and at its boiling point, wet carbon tetrachloride will corrode most of the common construction metals.	May be used in the presence or absence of air and light with the common construction metals at temperatures up to 100°C (212°F). In contact with water it hydrolyzes slowly at 80°C (176°F).	May be used in the presence of air, water, and light with any of the common construction metals at temperatures up to 120°C (248°F).	May be used in the presence of air, water, and light with any of the common construction metals at temperatures up to 140°C (284°F).	Compares in stability to ethylene dichloride.	Completely stable in the presence of air, water and light under normal atmospheric conditions. Practically nonflammable. Clear, colorless and pungent.	Not subject to oxidation in presence of light. Although there is a tendency to hydrolyze slowly in presence of water at elevated temperatures, hydrolysis at room temperature is negligible. Contact with aluminum should be avoided as this solvent corrodes aluminum excessively. An inhibitor is being sought for the aluminum reaction and may soon be available.
USES	Degreasing and cleaning metals, textiles, leather; fire-extinguishing fluid; fumigant; in organic syntheses; solvent for fats, oils, waxes, rubber, rosin, certain gums, resins, etc.	Cleaning metals, textiles, leather; fumigant; paint removers; in organic syntheses; solvent for fats, oils, waxes, some alkaloids, certain resins, and cellulose derivatives.	Vapor degreasing metals, ceramics; heat-transfer fluid; F. P.-depressant; solvent for oils, fats, waxes, alkaloids, rubber, resins; in org. synth.	Drycleaning fluid; vapor-degreasing and drying metals, etc.; heat-transfer medium; solvent for rubber, waxes, tar, paraffin, gums; in org. syntheses.	In cleaning and spotting mixtures; in organic syntheses; fumigant; insecticide; solvent for oils, fats, waxes, gums, and resins, also some dyes.	Metal cleaners and polishers (dissolves nonferrous oxides); in lacquers and varnishes; preservative, fumigant; in organic synthesis; solvent for oils, waxes, tars, sulfur, resins.	Cold cleaning.

* "NFPA Handbook of Fire Protection," Robt. S. Moulton, National Fire Protection Assoc., 11th Ed. (1954), pp. 295, 302, 314.
** "Threshold Limit Values for 1953," American Conference of Governmental Hygienists, A.M.A. Archives of Industrial Hygiene and Occupational Medicine, Vol. 8, pp. 296-7 (1953).

Etching Paints, Lacquers, etc.

TABLE 11 METAL ETCHING PROCEDURES

METALS	BATHS (May be Still or Agitated, or Sprayed)	OPERATING TEMPERATURE, °F	VOLTS	CURRENT DENSITY, Amp Per Sq Ft	METAL REMOVED PER MIN	REMARKS
ALUMINUM	3 parts nitric acid, 1 part hydrofluoric acid	Room	X	X	0.0005 in.	Pitch lined tank, fine etch
ALUMINUM	Tartaric acid solution, or acetic acid solution, or iron chloride solution	Room to 150	X	X	Up to 0.001 in.	Coarse etch, pitch lined tanks
ALUMINUM	Anodizing process, Aluminum Co. of America; Colonial Alloys Co.; proprietary processes	70 to 100	24 dc or 20 to 30 ac	12.5 dc or 20 to 36 ac	0.0002 to 0.0004 in. added in ½ hr	Insulated tank, highly adsorptive film, can be dyed
BRASS OR COPPER	10 pct sodium chloride or 36 pct (42°Be) iron perchloride, or 10 pct chromic acid	Room	8 to 10	1 to 3	0.0005 to 0.001 in.	Lead or graphite anode, insulated tank. Follow by immersion in sodium stannate and cyanide solution
NICKEL	45 pct (62°Be) sulphuric acid	85 to 140	8 to 10	280 to 560	0.0005 in. in 10 to 15 sec	Ceramic tank, lead or graphite cathode
18-8 STAINLESS STEEL	Ferric chloride solution, or nitric acid solution, or ferric sulphate solution	Room	5 to 6	1 to 2	0.0005 in.	Ceramic tank, lead or graphite cathode
STEELS (alloys)	25 pct by weight of sulphuric acid	Room	8 to 10	200 to 500	0.0005 to 0.001 in. in 5 min	Ceramic tank, lead or graphite cathode
STEEL	Ferric chloride solution, or ferric sulphate solution	Room	X	X	0.001 in.	Immersion process, coarse etch, ceramic tank
STEEL	1 gal 40 pct (42°Be) ferric chloride, 1 gal hydrochloric acid	Room	X	X	0.0005 in.	Immersion process, fine etch, ceramic tank
SILICA STEEL CASTINGS	Hydrofluoric acid and hydrochloric acid	Room	X	X	0.0005 in.	Pitch or rubber-lined tank, immersion process
STEEL	10 pct sodium chloride solution; hot solution of 3 to 5 pct ferric sulphate (ferrisul), non-electrolytic, also is used	Room	5 to 6	1 to 2	0.001 in.	Ceramic tank, lead or graphite cathode
ZINC	5 pct nitric acid solution	Room	X	X	0.002 in.	Ceramic tank, immersion process
ZINC Eastman Kodak process	10 to 25 pct copper sulphate and 20 pct sodium acid sulphate and 0.005 pct wetting agent	Room	X	X	0.0005 to 0.001 in.	Immersion process, fine etch

ETCHING RESISTS

Transfer of design by the use of steel dies and gelatin pads, or by the silk screen process, and for very large production by the lithographic (offset) method are the usual procedures. Varnish-base inks are used. The resist may be dusted over with resin and dragons blood then baked. Varnish or lacquer is applied to protect the reverse side of the metal against etching. Generally a mixture of ordinary mineral and lacquer solvents is used to remove lacquers and varnishes.

Besides prepared resists on the market the following are typical resists: (1) 9 fl oz of glue and 16 fl oz of water as a solution mixed with a solution made of 8 fl oz of water and 1½ oz of ammonium dichromate. (2) Or a resist made of the following: 250 g shellac, 20 g castor oil, 500 g methanol, 700 g propanol, 200 g isobutyl-alcohol and 4 g of caustic soda, to which solution is added a solution made of 10 pct ammonium, dichromate, the latter to comprise 90 pct of the total solution. Use shortly after preparing; may not be stored.

EMBOSSED METALS

Embossed effects may be obtained by metal etching procedures (which tend to weaken the metal), or by mechanical means.

Stamping operations have been too costly and limited as a procedure for many embossing requirements. Recently, however, a continuous roller embossing operation has been developed by the Rigid Tex Corp., Buffalo, which is said to produce more effective results at lower costs. Embossed metals may be utilized without further finishing or they may be plated. Aluminum may also be anodized or anodized and colored to further enhance the designs and multiply the number of optical effects. Wood graining effects followed by appropriate anodic dye coloring procedures will simulate wood.

Functionally, embossed metals have increased rigidity, strength and hardness; decoratively, many designs present two and three-tone effects and render finger prints less obvious, as well as serving to break up the monotony of plane surfaces.

Table courtesy COLONIAL ALLOYS CO., Philadelphia.

TABLE 12 INFRARED AND CONVECTION DRYING—TIMES AND TEMPERATURES

MINUTES	LAMP INFRARED INPUT WATTS PER SQ FT*						FORCED CONVECTION AIR TEMPERATURE		
	720		1080		1440		18 ga.		
	18 ga.	12 ga.	18 ga.	12 ga.	18 ga.	12 ga.	300°F	390°F	660°F
1	242°F	150°F	320°F	135°F	460°F	226°F	138°F	235°F	310°F
2	360	225	468	190	556	360	180	308	425
3	428	290	532	240	622	470	212	340	496
4	457	342	562	280	654	538	230	360	540
5	474	385	576	322	668	580	243	370	577
6	482	415	580	350	675	608	254	375	600
7	487	435	584	376	678	630	263	378	620
8	489	450	586	402	679	644	270	380	625
9	492	460	587	423	680	655	275	381	628
10	493	464	587	442	680	662	280	382	630

NOTE: Metal temperatures (approximate) are shown for three moderate infrared intensities and three forced convection oven air temperatures at normal velocity.

* Conventional lamp equipment provides input intensities up to effectively 3000 w per sq ft of product. Resistance type equipment is available up to 4500 w per sq ft. New lamp equipment can provide up to 13500 w per sq ft of product. Theoretically this latter value would approximate the performance of an 1800°F forced convection furnace or kiln.

Tables courtesy THE FOSTORIA PRESSED STEEL CORP., Fostoria, Ohio

TABLE 13 TYPICAL COATING PROPERTIES

COATING		RESISTANCE TO						Flexural Strength	Adhesion	Toughness	Color Retention
		Heat	Sunlight	Marring	Weak Acids	Mineral Solvents	Water				
NITROCELLULOSE LACQUERS	Clear Pigmented	Poor Poor	Fair Good	Good Good	Poor Poor	Fair Fair	Poor Poor	Good Good	Good Good	Good Good	Fair Good
ALKYD	Clear Pigmented	Fair Fair	Good Excellent	Good Good	Fair Fair	Fair Fair	Good Good	Good Good	Good Good	Good Good	Good Excellent
ALKYD-UREA	Clear Pigmented	Good Good	Good Good	Excellent Excellent	Good Good	Good Good	Good Good	Fair Fair	Good Good	Good Good	Good Good
ALKYD MELAMINE	Clear Pigmented	Good Good	Good Good	Excellent Excellent	Good Good	Good Good	Good Good	Fair Fair	Good Good	Good Good	Good Good
PHENOL FORMALDEHYDE (heat-setting)	Clear Pigmented	Good Good	Fair Fair	Excellent Excellent	Excellent Excellent	Excellent Excellent	Excellent Excellent	Poor Poor	Fair Good	Good Good	Fair Fair
CHLORINATED RUBBER	Clear Pigmented	Fair Fair	Poor Good	Fair Fair	Good Good	Poor Poor	Good Good	Fair Fair	Good Good	Good Good	Poor Good
SHELLAC	Clear	Fair	Poor	Good	Poor	Good	Poor	Poor	Good	Good	Poor
OIL-BASE PAINTS	Pigmented	Fair	Good	Fair	Poor	Fair	Good	Good	Good	Good	Good
MODIFIED EPOXY (heat-setting)	Clear Pigmented	Good Good	Fair Good	Excellent Excellent	Good Good	Excellent Excellent	Good Good	Good Good	Good Good	Good Good	Fair Good
EPOXY-ESTERS	Clear Pigmented	Good Good	Good Good	Good Good	Good Good	Fair Fair	Good Good	Good Good	Good Good	Good Good	Good Good
VINYLS	Clear Pigmented	Fair Fair	Poor Good	Fair Fair	Good Good	Fair Fair	Fair Fair	Excellent Excellent	Fair Fair	Good Good	Poor Good

Table courtesy THE VORAC CO., Rutherford, N. J.

Mechanical Finishing

TABLE 14 — DEBURRING AND FINISHING WITH NON-METALLIC MEDIUMS

METAL	FORM	MEDIUM	TYPE†	COMPOUND†	AMOUNT OF COMPOUND*	WATER*	ROLLING TIME	FINISH
STEEL (mild)	Stampings Forgings Screw Mach. Parts	¼ to 1 in. ¼ to 1 in.	Type I Type II	Class A or B	2–3 lb	1–2 gal	1–6 hr	Matte
		¼ to ½ in. ¼ to ½ in.	Type I Type II	Class D	4–8 oz	4–5 gal	½–3 hr	Bright
BRASS BRONZE	Sand Castings	⅓ to 1 in.	Type I	Class A	2–3 lb	1–2 gal	15–25 hr	Matte
		1/16 to ½ in.	Type II	Class D	This may be followed with 4–8 oz	4–5 gal	1–3 hr	Bright
BRASS (light burr)	Stampings Screw Mach. Parts	⅛ to ½ in.	Type I	Class D	4–8 oz	4–5 gal	1–2 hr	Bright
ALUMINUM	Castings Forgings Stampings	½ to 1 in. ¼ to ¾ in.	Type II Type I	Class A or B	1–2 lb	2 gal	1–5 hr	Dull to Matte
	Forgings Stampings	½ to 1 in. ¼ to ¾ in.	Type II Type I	Class B	1–2 lb	2 gal	2–6 hr	Dull
		⅛ to ¼ in.	Type I	Class D	4–6 oz	4–5 gal	1–3 hr	Bright
NICKEL SILVER	Stampings Forgings	¼ to ¾ in. ⅛ to ½ in.	Type II Type I	Class B	½–2 lb	1–2 gal	1–4 hr	Dull
		¼ to ¾ in. ⅛ to ¼ in.	Type II Type I	Class D	This may be followed with 4–8 oz	4–5 gal	1–2 hr	Bright
ZINC BASE	Castings	¼ to ¾ in.	Type II	Class B	1–2 lb	1–2 gal	1–10 hr	Dull
		⅛ to ½ in.	Type I	Class D	This may be followed with 4–5 oz	4–5 gal	1–2 hr	Bright
		⅛ to ½ in. ¼ to ¾ in.	Type I Type II	Class D	4–5 oz	4–5 gal	½–1 hr	Bright
STAINLESS STEEL	Stampings	¼ to 1 in. ⅛ to ¾ in.	Type I Type II	Class A	1–2 lb	1–2 gal	1–8 hr	Dull
		⅛ to ¼ in.	Type I	Class D	This may be followed with 4–8 oz	4–5 gal	3–6 hr	Bright

† See accompanying legend.
* Weights and volumes are given per cubic foot of mixed work and medium.

Table Courtesy FREDERICK GUMM CHEMICAL CO., Kearny, N. J.

ROLLING MEDIUM

Basically there are three types of rolling medium used in deburring.

TYPE I—Cutting type — Usually this class is based on aluminum oxide, either natural, fused or bonded. This type has heavy cutting ability and does not tend to glaze easily.

TYPE II—Various stones or ceramic media. This type has mild cutting action for a time and then tends to glaze unless used with an abrasive compound.

TYPE III—Metallic slugs. Zinc or soft steel. These have no cutting action per se but always require the use of abrasive compounds.

COMPOUNDS

CLASS A—Heavy cutting abrasive with various detergents, buffers, etc.

CLASS B—Medium cutting abrasive with various detergents, buffers, etc.

CLASS C—Fine cutting abrasive with various detergents, buffers, etc.

CLASS D—Compound containing no abrasive but only detergents, lubricants, buffers, etc.

METALLIC DEBURRING

METAL	FORM	COMPOUND†	AMOUNT OF COMPOUND§	AMOUNT OF WATER§	ROLLING TIME	FINISH
ALUMINUM	Casting Forging	Class B	1–2 lb	2–3 gal	1–6 hr	Light Matte
		Class C	½–1 lb	2–3 gal	1–3 hr	Dull to glossy
BRASS	Screw Mach. Stamping Machined Castings	Class B Class C	1–2 lb	2–3 gal	2–5 hr	Light Matte
ZINC BASE	Castings	Class B	1–2 lb	2–4 gal	1–3 hr	Light Matte
			Tumble flush well and follow this with			
		Class D	10–12 oz	3 gal	15 min	Bright
STAINLESS STEEL	Stampings Forgings	Class A	1–2 lb	1–3 gal	3–10 hr	Matte
			Tumble flush and follow this with			
CASE HARDENED STEEL			1–2 lb	1–3 gal	3–12 hr	Dull
			Tumble flush and follow this with			
		Class B Class C	½–1 lb	1–2 gal	4–10 hr	*High Polish
	Smooth Machined or previously tumbled parts	Class C	1–2 lb	2–4 gal	5–9 hr	Brilliant

† See accompanying legend.
§ Weights and Volumes are given per cubic foot of work plus medium.
* Maximum brilliance is obtained by a final burnish of 15 minutes to 1 hour.

Table courtesy FREDERICK GUMM CHEMICAL CO., Kearny, N. J.

RECOMMENDED SIZES OF SHOT AND GRIT

The choice of the proper sized abrasive is a matter of careful appraisal of the type of equipment available, the size and characteristics of the work piece, the type of finish desired, etc. The following table can serve only as a general guide.

DIAMOND GRIT

G-10, G-12 — Cleaning of large grey iron and steel castings—Electric motor frames, cast gears, pressure tanks.

G-14, G-16 — Cleaning of grey iron, malleable iron and steel castings of large and medium size. Preparation of surfaces prior to enameling—both tubs, plumbing fixtures.

G-18, G-25 — Cleaning of medium-sized grey iron, malleable and steel castings and steel forgings and heat treated parts. Preparation of sheet steel for coating. Textile machinery, jobbing foundry work, stove parts, electrical control boxes, reclamation of steel drums, automotive parts, facing of abrasive wheels.

G-40, G-50 — Cleaning of non-ferrous castings. Finishing of grey iron castings, steel forgings or heat treated parts. Hardware, tools, ball bearing races, misc. machine components.

G-80, G-120, G-200 — Cleaning or finishing of delicate work, ferrous or non-ferrous. Rifle parts, needle bearings, drills.

CHILLED SHOT

SAE 1320 — Back up material for molds using "C" process.

1110 — Burnishing balls in tumbling barrels.

930 — Special weighting material.

780 — Cleaning of large steel castings.

660 — Cleaning of large grey iron castings, steel forgings—motor blocks, axle housings, transmission cases, gate valves, crankshafts, railway equipment.

550 — Cleaning of grey iron and malleable castings—motor blocks, flywheels, manifolds, brake drums, valves. Peening of aircraft propellers.

460 — Cleaning of medium-sized grey iron, malleable iron and steel castings and forgings—valve guides, conveyor parts, agricultural equipment, radiators, textile machines, plumbing fittings.

390 — Cleaning of grey iron and malleable iron castings—lawn mower parts, switch boxes, run-of-the-mill jobbing foundry work, textile machines.

330 — Cleaning of small grey iron and malleable iron castings—tools, pump parts, plumbing fittings, textile machinery, small automotive and machine parts. Peening of aircraft engine parts.

230 — Cleaning of small parts—grey iron, malleable iron, and non-ferrous materials. Peening of flat and coil springs.

170, 110, 70 — Cleaning of thin-section pieces—stampings, knife blades, small tools. Peening and cleaning of turbine blades. Cleaning and finishing of non-ferrous parts.

(See next page for shot and grit sizes)

Tables courtesy HARRISON ABRASIVE DIV., Metals Disintegrating Co., Elizabeth, N. J.

TABLE 15 CAST SHOT NUMBERS AND SCREENING TOLERANCES

SAE SHOT NO.†	ON SCREEN	PER CENT MAX.	THRU SCREEN	ON SCREEN	PER CENT MAX.	THRU SCREEN	ON SCREEN	PER CENT MIN.	THRU SCREEN	ON SCREEN	PER CENT MAX.	THRU SCREEN	PER CENT MAX.
1320	4	0	—	—	—	4	6	90	6	7	7	7	3
1110	5	0	—	—	—	5	7	90	7	8	7	8	3
930	6	0	—	—	—	6	8	90	8	10	7	10	3
780	7	0	—	—	—	7	10	85	10	12	12	12	3
660	8	0	—	—	—	8	12	85	12	14	12	14	3
550	10	0	—	—	—	10	14	85	14	16	12	16	3
460	10	0	10	12	5	12	16	80	16	18	11	18	4
390	12	0	12	14	5	14	18	80	18	20	11	20	4
330	14	0	14	16	5	16	20	80	20	25	11	25	4
230	18	0	18	20	10	20	30	75	30	35	12	35	3
170	20	0	20	25	10	25	40	75	40	45	12	45	3
110	30	0	30	35	10	35	50	70	50	80	10	80	10
70	40	0	40	45	10	45	80	70	80	120	10	120	10

CLEANING GRIT NUMBERS AND SCREENING TOLERANCES

SAE GRIT NO.	HIGH LIMIT SCREEN		NOMINAL SCREEN		LOW LIMIT SCREEN	
	GRIT RETAINED, PCT MAX.	SCREEN NO.	GRIT RETAINED, PCT MAX.	SCREEN NO.	GRIT TO PASS, PCT MAX.	SCREEN NO.
G 10	0	7	80	10	10	12
G 12	0	8	80	12	10	14
G 14	0	10	80	14	10	16
G 16	0	12	75	16	15	18
G 18	0	14	75	18	15	25
G 25	0	16	70	25	20	40
G 40	0	18	70	40	20	50
G 50	0	25	65	50	25	80
G 80	0	40	65	80	25	120
G 120	0	50	60	120	30	200
G 200	0	80	55	200	35	325
G 325	0	120	20	325	—	—

SCREEN NUMBERS AND APERTURES (INCHES)

4	0.187	20	0.0331
5	0.157	25	0.0280
6	0.132	30	0.0232
7	0.111	35	0.0197
8	0.0937	40	0.0165
10	0.0787	45	0.0138
12	0.0661	50	0.0117
14	0.0555	80	0.007
16	0.0469	120	0.0049
18	0.0394	200	0.0029
		325	0.0017

* Per cent of total ample by weight retained by "on" screen and passed by "thru" screen. Thus 4 (0.187) denotes screen No. 4 with 0.187-in. aperture. Percentages given are the basis of weight as determined by the test procedure for shot.

† The Society of Automotive Engineers' Recommended Practice provides for standard Shot and Grit size numbers. For Cast Shot, this number corresponds with the aperture size of the nominal screen. For Grit, this number corresponds with the number of the nominal screen with the prefix G added.

TABLE 16

POLISHING WHEEL GRIT SIZES

PARTS	POLISHING OPERATION				
	FIRST	SECOND	THIRD	FOURTH	FIFTH
AXES	46	80	120	180*	.....
ALUMINUM, SAND CAST (Inside-Bottom)	36 or 46	.....	.....	.....	.....
ALUMINUM, SAND CAST (Outside)	60 or 80	150	Buff	.....	.....
ALUMINUM, DIE CAST	150*	Buff	.....	.....	.....
ALUMINUM, SHEET	120*	180*	Buff	.....	.....
AUTO BUMPERS	60-90	120	180*	220*	Buff
AUTO HEADLIGHTS	180 or 220*	Buff	.....	.....	.....
BAND SAW STEEL	60-80	120 or 150	.....	.....	.....
BRASS, SAND CAST	60-80*	150 or 180*	.....	.....	.....
BRASS, SHEET	180 or 220*	Buff	.....	.....	.....
ELECTRIC IRONS	80	120*	150*	180 to 240*	.....
GRAY IRON, PICKLED	80	120 or 150	.....	.....	.....
GRAY IRON, NOT PICKLED	70	120 or 150	.....	.....	.....
HAMMER HEADS	46 or 60	100 or 120*	.....	.....	.....
KNIVES, TABLE AND STEEL BLADES	120 or 150*	180 240 double header machine	Buff	.....	.....
KNIVES, TABLE, BACKS	46 or 60	.....	.....	.....	.....
KNIVES, MACHETE, EDGES	46 or 60	.....	.....	.....	.....
KNIVES, MACHETE, FACES	80	120*	.....	.....	.....
LOCOMOTIVE SIDE RODS	36	60	120	.....	.....
MONEL METAL, DEEP DRAWN	120	150	180*	Buff	.....
MONEL METAL, CAST	80	120	150	180*	Buff
MONEL METAL, FULL FINISH SHEET	150	180*	220*	Buff	.....
PLOWS	24	80	150	220*	.....
PLOWSHARES	36 or 46	.....	.....	.....	.....
PLOW DISCS	36 or 46	80	.....	.....	.....
SHEARS, TINSMITH	46	80	120	180	.....
SHOVELS, BLADES	36 or 46	120	.....	.....	.....
SHOVELS, STRAPS	36-60	120	.....	.....	.....
STAINLESS STEEL, MIRROR FINISH	60-80	100-120*	150*	220 or 3F*	Buff
STAINLESS STEEL, COMMERCIAL FINISH	80	100*	120*	150*	.....
WRENCHES	36 or 46	80	120*	.....	.....

NOTE: These recommendations are merely a guide and may vary somewhat under varying conditions. Grit sizes above are based on use of glue as a bonding agent. If wheels are set up with cold cement, one grit size finer is generally recommended. The abrasive is aluminum oxide.

* Denotes grease or oil wheel.

Table courtesy NORTON CO., Worcester, Mass.

TABLE 17 HOW TO SELECT POWER BRUSHES

For Jobs Requiring Surface Finish Less Than 30 Microinches rms			For Jobs Which Permit or Require Surface Finish Exceeding 30 Microinches rms*		
Medium	Brush Flexibility	High	Low	Brush Flexibility	High
Very Fine (Low rms)	Brush Finishing Ability	Medium	Fine	Brush Finishing Ability	Coarse
Medium	Brushing Action	Very Fast	Medium Fast	Brushing Action Medium	Fast

Cord and Fabric Brushes	Tampico and Treated Tampico Brushes	Fine Wire Sections Used with Burring Compound	Wire Wheels	Wire Sections	Coiled Knot Sections
MAJOR BRUSH CHARACTERISTICS					
Fast cutting medium flexible wheels. Used with cut and color buffing compounds for producing low micro-inch finishes	Flexible, fast cutting wheels. Used with burring compounds of tacky composition for producing surface finishes of approx. 8 to 10 microinches rms	For efficient use of wire brushes with compound, select brushes having medium or high density and fine wire size (0.008 diam or finer)	Wide face, dense fill. Used where fast cutting and fine finishes are required. Best general purpose wire brush	Narrow face, medium density. Used where medium brush flexibility is essential to follow contoured surfaces	Narrow face, low density. Used where a high degree of brush flexibility is needed and where surface impact action is necessary, especially to remove surface encrustations
MAJOR APPLICATIONS IN ORDER OF GENERAL USAGE					
1. Cut and color buffing 2. Surface blending 3. Light scale removal 4. Producing radii 5. Burr removal	1. Burr (small) removal 2. Producing radii 3. Light scale removal 4. Surface blending 5. Cleaning 6. Satin finishing	1. Burr (medium) removal 2. Light scale removal 3. Satin finishing 4. Producing radii	1. Burr (heavy) removal 2. Producing radii 3. Rust and oxide removal 4. Scale removal 5. Cleaning 6. Surface blending	1. Cleaning 2. Medium scale removal 3. Rust and oxide removal 4. Satin finishing 5. Surface blending 6. Burr removal	1. Heavy scale removal 2. Rust and oxide removal 3. Satin finishing 4. Producing radii 5. Burr removal (on very hard metals)
ADJUSTMENTS FOR DESIRED RESULTS					
Brush works too slowly	Brush works too fast	Action of brush peens burr to adjacent surface	Finer or smoother finish required	Finish too smooth and lustrous	Brushing action not sufficiently uniform
1. Increase surface speed by increasing OD or rpm 2. Decrease trim length and increase fill density 3. Increase filament diam	1. Reduce surface speed by reducing rpm or OD 2. Reduce filament diam 3. Reduce fill density 4. Increase trim length	1. Decrease trim length and increase fill density 2. If wire brush tests indicate metal too ductile (burr is peened rather than removed), change to nonmetallic brush such as a treated Tampico used with burring compound	1. Decrease trim length and increase fill density 2. Decrease wire diam 3. Try treated Tampico or cord brushes with suitable compounds at recommended speeds 4. Use auxiliary buffing compound with brush	1. Increase trim length 2. Reduce brush fill density 3. Reduce surface speed 4. Increase filament diam	1. Increase trim length and decrease fill density 2. Devise hand held or mechanical fixture or machine which will avoid irregular off-hand manipulation

* For very ductile metals see Adjustments Column.

Table courtesy THE OSBORN MFG. CO.

Rust Preventives

TABLE 18 RUST PREVENTIVES, U. S. Government Specifications

SPECIFICATION NO.	FILM TYPE	METHODS OF APPLICATION	USES	PHYSICAL REQUIREMENTS	EXPOSURE REQUIREMENTS
ARMY USA 2-82	Compound, heavy, greasy, solid film	Dip 175–200°F Spray 200–220°F	Highly finished metal surfaces, elevated storage temperatures	Non-drying, 1 year outdoors, 10 years indoors	Humidity 19 hr, ultra-violet 7 days, weather 30 days
USA 2-84B	Compound, light, soft, greasy, thick film	Dip 155°F Brush 60–120°F Spray 190°F	Indoor, overwrapped parts	Non-drying, M.P. 120°F	Humidity 300 hr at 100%, indoor 1 year
USA 2-120	Lubricating oil, light, non-drying, thin film	Dip, spray, brush at 60–120°F	Small assemblies, machine guns and small arms	Nondrying, flash pt. 275°F min	Humidity 200 hr min at 100% and at 100°F
USA 2-121	Medium, hard grease, firm, thick film	Dip 165°F Brush 80–100°F Spray 190°F	Highly polished parts, long term indoor, short term outdoor	M.P. 140°F min, penetration 120–160, dries 14 days min	20 days min salt spray, 10 days humidity, 14 days ultra-violet
USA 2-122	Lubricating oil, medium, non-drying, thin film	Dip, brush, spray 60–120°F	Highly finished surfaces	Nondrying SAE 30	300 hr min humidity at 100°F, 20 hr min salt water immersion
USA 3-182	Synthetic resin, varnish film, transparent	Dip, spray, brush	Electrical circuits, engine parts	0.001″ thick, can be handled in 8 hr	100 hr min in 4% salt spray
USA 14-0-17	Lubricating oil, medium, non-drying, thin film	Dip, brush, spray 60–120°F	Highly finished surfaces		
ARMY-NAVY AN-C-52 Type 1	Dark solution film, thick 0.002–0.0025″	Dip, spray, brush	Parts not bright finished	Soluble in kerosene, F.P. 100°F min, drying time 24 hr max	300 hr min salt spray, 20 hr min sea water dip
AN-C-52 Type 2, Gr. A	Soft, dark, grease, removed by kerosene	Dip 135–165°F Brush 60°F	On high finishes for temporary outdoors or 1-year indoor exposure to high temperatures and abrasion	M.P. 133°F, penetration 200–275 min drying time, 120 hr at 70°F	300 hr min, 100% humidity @ 100°F
Type 2, Gr. B	Hard, dark, thick film, removed by kerosene	Dip or brush 150–185°F	On high finishes, exposure to high temperatures and abrasion up to 10 years	M.P. 150°F min, penetration 88–90 min	30 days weather protection
AN-C-52A Type 1	Dark compound, 0.001″ film, firm thick, grease film	Hot dip only 170–210°F	Severe open work exposure, requires over-wrap	F.P. 100°F min, dries to hard film, sets in 24 hr to permit handling	Withstands weather 1-year min, humidity 4 weeks @ 120°F, salt spray 4 weeks
Type 2	Dark solution, 0.001″ film, removed in 24 hr by kerosene	Dip, brush, spray 170–220°F	Severe open work exposure	F.P. 350°F min, M.P. 150°F min, penetration point 30–90	Salt spray 4 weeks, weather for 1-year, withstands 135°F for 4 weeks
AN-C-117	Plastic material film	Dip 360°F	Small parts for shipment	450 psi min tensile strength, 50% min elongation	Humidity 725 hr min at 100% and 100°F
AN-C-124 Type 1	Compound, soft film, greasy, 0.002″ thick	Dip, brush, spray 70–95°F	Indoor storage	F.P. 100°F min, sets in 48 hr	Salt spray 2 weeks, humidity, 4 weeks at 120°F
Type 2	Compound, soft film, greasy, 1/32″ thick	Hot dip only, 138–180°F	Indoor storage of anti-friction bearings	M.P. 110–150°F, non-drying	Salt spray 2 weeks, humidity, 4 weeks @ 120°F
AN-C-125	High melting point wax	Dip 180–200°F	Sealing packages	Softens 145°F min, penetration 60 max, setting time 1 week	None required
AN-VV-C-576 Type I Type II	Oil, non-drying, thin film	Blending 25% with lubricating oil	Additive to aircraft engine lubricating oil	Non-drying	Humidity 150 hr min @ 120°F
ARMY ORDNANCE AXS 673	Compound, thin film, 0.002–0.008″ thick	Dip, brush, spray 40–95°F	Outdoor or indoor, non-critical material	Sets 24 hr to permit handling	Salt spray 10 days min, humidity 30 days min
AXS 674	Inhibited lubricating oil	Dip, spray, brush	Highly finished operating parts other than internal combustion engines	F.P. 100°F min, max drying time 24 hr	Salt spray 300 hr, min, sea water 20 hr min
AXS 702	Light, non-hardening oil	Dip, spray, brush	Temporary lubrication and protection	F.P. 100°F min	Humidity 200 hr min

RUST PREVENTIVES, U. S. Government Specifications (Continued)

SPECIFICATION NO.	FILM TYPE	METHODS OF APPLICATION	USES	PHYSICAL REQUIREMENTS	EXPOSURE REQUIREMENTS
AXS 777	Oil, light color, low pour	Dip, spray, brush	Small assemblies	F.P. 275°F min	Humidity 200 hr min
AXS 934 Gr. I Gr. II	Engine oil, inhibited, thin film	Dip, spray, brush 60–120°F	Air compressors and engines other than aircraft	SAE 30 lubricant and corrosion preventive	Humidity 200 hr min, sea water 20 hr min
AXS 1001	Grease, medium-hard	Dip, spray 200–210°F	Highly finished parts, long term indoor, short term outdoor	M.P. 140°F min, penetration 120–160, dries 14 days min	Salt spray 20 days min
AXS 1015	Wax, high melting point	Dip 180–200°F	Sealing packages	Softens 145°F min, penetration 60 max	20% water absorption weight increase
AXS 1167	Plastic material, film removed by peeling	Dip 360–370°F	Small parts for shipment	450 psi tensile strength, 50% elongation	Humidity 725 hr min at 100% and 100°F
AXS 1347	Dark, soft, greasy, non-drying film, 1/32" thick, removed with solvent	Hot dip 150–170°F	Anti-friction bearings	Non-drying	Humidity 2 weeks min at 100°F
MILITARY MIL-C-6529 Type I Type II Type III	Corrosion preventive compounds	Blending	Aircraft engines	Physicals required	50 hr engine test
MIL-C-15167 (ships)	Compound, rust-preventive, thick film				
Type A	Non-drying, medium, non-pigmented	Immersion, brush	Rust preventive	Shall not dry or harden	Not corrode steel, copper, or aluminum
Type B	Non-oxidizing, pigmented plastic	Brush, 70–190°F	Rust preventive	Plastic and non-oxidizing	Not corrode steel, copper or aluminum
Type C	Non-slick, non-pigmented	Brush	Rust preventive	No oil slick on salt water	Not corrode steel, copper or aluminum
MIL-C-16173 Gr. 1	Corrosion preventive, solvent dispersed, thin, easily removable films Hard film	Brush	Outdoor weathering	Flash pt. 100°F min, dry to touch in 4 hr	1-year outdoors, 14 days min salt spray
Gr. 1A	Hard film	Brush	Outdoor weathering	Flash pt. 100°F min, dry to touch in 4 hr	1-year outdoors
Gr. 2	Soft film	Brush	Undercover protection	Flash pt. 100°F min	7 days min salt spray
Gr. 3	Water displacing soft film	Brush, immersion	Displace water or saline solutions	Flash pt. 100°F min	Shed storage ½ year min
MIL-L-644A	Lubricating oil, preservative	Brush, dip	Small arms, lubrication and protection	Corrosion and oxidation tests, flash pt. 275°F min, pour pt. 70°F max	Corrosion and oxidation
MIL-L-3150	Lubricating oil, preservative, medium	Immersion, spray, brush	Lubrication and corrosion preventive	Viscosity 185–255, pour pt. 20°F max	Humidity 300 hr min, salt spray 48 hr min
MIL-R-10036	Rust arresting compound	Brush, spray	Rust arrester, prolonged outdoor storage	Dry hard in less than 24 hr, clear, transparent	300 hr weatherometer
NAVY 52-C-16 Gr. 1 Gr. 2	Petrolatum material Petrolatum Petrolatum	Spray or brush Brush, spray Brush, spray	Loosening scale and rust prior to wire brushing	 F.P. 280°F min F.P. 315°F min	Salt spray required
52-C-17 Type A	Thick film Oil, thick film	Brush, dip	Working surfaces	F.P. 450°F min	Oven and salt water tests
Type B	Plastic, semi-hard, red, contains 0.2% sodium chromate	Brush 180–190°F	Steel decking, etc.	F.P. 450°F min	Oven and salt water tests
Type C	Plastic, semi-hard, brown	Brush 170–190°F	Submarine ballast tanks	M.P. 120°F min	Slick test
52-C-18 Type 1	Thin film polar-type compound, semi-hard, 0.002" thick	Spray, dip, brush at 40–95°F	Outdoor, non-critical parts	F.P. 100°F min, sets in 24 hr to permit handling	50 day weatherometer, 4 weeks min salt spray
Type 2	Polar-type compound, soft film, 0.001" thick	Spray, dip, brush at 40–95°F	Indoors	F.P. 100°F min, non-drying, soluble in lubricating oil	28 days weatherometer, 2 weeks min salt spray
Type 3	Amber solvent solution, 0.003" thick	Spray, dip, brush at 40–95°F	Steam and humid exposure	F.P. 100°F min	Humidity 14 days min, shed exposure 4 months
52-C-31	High melting point wax	Dip 180–200°F	Sealing packages	Softens 145°F min, penetration 60 max, 1-week setting time	20% water absorption weight increase
ORDNANCE O. S. 627	Petrolatum material, firm thick grease, contains sodium chromate	Hot dip 170–190°F	Guns under severe exposure	M.P. 150–160°F, non-drying, hard to remove	1-year weather resistance
O. S. 1361	Lubricating oil, non-drying, thin film	Dip, brush, spray 60–120°F	Aircraft guns	Non-drying, less than SAE 10, pour pt. 70°F	Humidity 200 hr min, salt spray 24 hr min
O. S. 1362	Lubricating oil, light, thin film	Dip, spray, brush 60–120°F	Small arms, lubrication and protection	Pour pt. 50°F, non-hardening, less than SAE 10	Humidity 200 hr min, 24 hr in 4% salt spray
O. S. 1363	Lubricating oil, medium, non-drying	Dip, brush, spray 60–120°F	Highly-finished surfaces	Non-drying, SAE 30	Humidity 200 hr min, 96 hr in 4% salt spray

Compiled by N. E. Woldman, Upper Montclair, N. J.

Plating Processes

TABLE 19 METALLIC COATINGS
U. S. Government Specifications

SPECIFICATION NO.	TITLE	COATING CHARACTER	THICKNESS IN INCHES	FINISH	SALT SPRAY TEST REQUIREMENTS
ARMY USA 57-0-2C	Finishes, protective for iron and steel parts	Electrodeposited zinc, cadmium, lead, nickel, chromium	Depends on metal deposited according to class	Depends on metal deposited according to class	Depends on metal deposited according to class
USA-AXS 1601 (Ord.)	Lead alloy for iron and steel parts	Hot dip alloy of lead-tin			
Type A		Low tin	0.002″ min	None required	48 hr min
Type B		Med. tin	0.002″ min	None required	72 hr min
Type C		High tin	0.002″ min	None required	96 hr min
ARMY-NAVY AN-P-32	Plating zinc	Zinc, electrodeposited	0.0005″ min except otherwise specified	Smooth, fine-grained	100 hr min
AN-P-61	Plating cadmium	Cadmium, electrodeposited			
Type I		Cadmium	0.0003″ min, except otherwise specified	Without post plate treatment	200 hr min
Type II		Cadmium	0.0003″ min, except otherwise specified	With post plate treatment	200 hr min
FEDERAL O-G-93	Galvanizing repair	Alloy of zinc, tin and lead	(Completely liquid at 475°F)	For regalvanizing welds in galvanized steel	100 hr min
QQ-P-461 Amend. 1	Plating cadmium	Cadmium, electrodeposited			
Type I, Cl. A		Cadmium	0.005″ min	With supplementary chromate or phosphate treatment	240 hr min
Type I, Cl. B		Cadmium	0.003″ min	With supplementary chromate or phosphate treatment	192 hr min
Type I, Cl. C		Cadmium	0.0002″ min	With supplementary chromate or phosphate treatment	96 hr min
Type II, Cl. A		Cadmium	0.005″ min	With supplementary chromate treatment	336 hr min
Type II, Cl. B		Cadmium	0.003″ min	With supplementary chromate treatment	188 hr min
Type II, Cl. C		Cadmium	0.0002″ min	With supplementary chromate treatment	92 hr min
Type III, Cl. A		Cadmium	0.005″ min	With supplementary phosphate treatment	240 hr min
Type III, Cl. B		Cadmium	0.003″ min	With supplementary phosphate treatment	192 hr min
Type III, Cl. C		Cadmium	0.0002″ min	With supplementary phosphate treatment	96 hr min
QQ-Z-325	Plating zinc	Zinc electrodeposited			
Type I, Cl. 1		Zinc	0.0010″ min	With supplementary chromate or phosphate treatment	192 hr min
Type I, Cl. 2		Zinc	0.0005″ min	With supplementary chromate or phosphate treatment	96 hr min
Type I, Cl. 3		Zinc	0.0002″ min	With supplementary chromate or phosphate treatment	36 hr min
Type 2, Cl. 1		Zinc	0.0010″ min	With supplementary chromate treatment	192 hr min
Type 2, Cl. 2		Zinc	0.0005″ min	With supplementary chromate treatment	96 hr min
Type 2, Cl. 3		Zinc	0.0002″ min	With supplementary chromate treatment	36 hr min
Type 3, Cl. 1		Zinc	0.0010″ min	With supplementary phosphate treatment	192 hr min
Type 3, Cl. 2		Zinc	0.0005″ min	With supplementary phosphate treatment	96 hr min
Type 3, Cl. 3		Zinc	0.0002″ min	With supplementary phosphate treatment	36 hr min
MILITARY MIL-M-6874	Metal spraying	All metals		Finish after spray	None required
		Aluminum	0.002–0.004″	Dichromate treatment	
		Steel	0.004″ min	Rubbed with abrasive	
MIL-P-6859	Plating nickel	Nickel, electrodeposited			
Type I, Cl. A		Thin nickel	0.001″ min	Matte finish	48 hr min
Type I, Cl. B		Thin nickel	0.0005″ min	Bright finish	48 hr min
Type II, Cl. A		Heavy nickel	0.003″ min	Plated to dimensions	As specified
Type II, Cl. B		Heavy nickel	0.003″ min, after machining or grinding	Plated to dimensions after machining or grinding	As specified
MIL-P-6871	Plating chromium	Chromium, electrodeposited			
Type I		Thin chromium	0.00002″ min	Bright finish	None required
Type II, Cl. A		Heavy chromium	0.002″ min	Plated to dimensions	None required
Type II, Cl. B		Heavy chromium	0.002″ min	Ground to dimensions after plate	None required
MIL-P-20218	Plating chromium (porous)	Chromium electroplating			
Type I		Channel chromium	0.005″ min radial	After honing	None required
Type II		Pin-point chromium	0.005″ min radial	After honing	None required

METALLIC COATINGS U. S. Government Specifications (Continued)

SPECIFICATION NO.	TITLE	COATING CHARACTER	THICKNESS IN INCHES	FINISH	SALT SPRAY TEST REQUIREMENTS
MIL-T-10727	Plating tin	Tin, hot-dipped or electrodeposited			
Type I		Electrodeposited tin	As specified	Bright	24 hr min
Type II		Hot-dipped tin	As specified	Bright	24 hr min
NAVY 46Z3	Zinc coating	Hot-dipped or galvanized zinc	(Wrought) max obtained at 865°F, (castings) max obtained at 845°F	Adherent, smooth, free from uncoated spots	None required
ASTM A-123-53	Zinc (hot galvanized) coatings on steel products	Zinc, hot galvanized	Weight of coating, not less than 2.0 oz/sq ft of surface	Bright	None required
B-141-49	Electrodeposited coating, nickel, chromium, on copper and copper alloys	Electrodeposited nickel or chromium			None required
Type FC		Nickel	0.0005″ min	Bright	
Type FC		Chromium	0.00001″ min	Bright	
Type KC		Nickel	0.0003″ min	Bright	
Type KC		Chromium	0.00001″ min	Bright	
Type QC		Nickel	0.0001″ min	Bright	
Type QC		Chromium	0.00001″ min	Bright	
B-142-53	Electrodeposited coatings of nickel and chromium on zinc and zinc-base alloys	Electrodeposited nickel or Chromium			
Type FZ		Cu plus Ni	0.00120″ min		48 hr min
		Copper	0.00020″ min		
		Nickel	0.00050″ min		
		Cr if required	0.000010″ min		
Type KZ		Cu plus Ni	0.00075″ min		32 hr min
		Copper	0.00020″ min		
		Nickel	0.00030″ min		
		Cr if required	0.000010″ min		
Type QZ		Cu plus Ni	0.00050″ min		16 hr min
		Copper	0.00020″ min		
		Nickel	0.00030″ min		
		Cr if required	0.000010″ min		
A-153-53	Zinc coating (hot-dip) on iron and steel	Zinc, hot-dipped	None required		None required
A-164-53	Electrodeposited coating of zinc on steel	Zinc, electrodeposited			None required
Type GS		Zinc	0.001″ min		
Type LS		Zinc	0.0005″ min		
Type RS		Zinc	0.00015″ min		
A-165-53	Electrodeposited coatings of cadmium on steel	Cadmium, electrodeposited			None required
Type NS		Cadmium	0.0005″ min		
Type OS		Cadmium	0.0003″ min		
Type TS		Cadmium	0.00015″ min		
ASTM A-166-53T	Electrodeposited coatings of nickel and chromium on steel	Nickel and chromium, electrodeposited			None required
Type DS		Cu plus Ni	0.0020″	Bright	
		Final nickel	0.00100″	Bright	
		Cr if required	0.000010″	Bright	
Type FS		Cu plus Ni	0.0012″ min	Bright	
		Final nickel	0.00060″ min	Bright	
		Cr if required	0.000010″ min	Bright	
Type KS		Cu plus Ni	0.00075″ min	Bright	
		Final nickel	0.00040″ min	Bright	
		Cr if required	0.000010″ min	Bright	
Type QS		Cu plus Ni	0.00040″ min	Bright	
		Final nickel	0.00020″ min	Bright	
		Cr if required	0.000010″ min	Bright	
B-200-53T	Electrodeposited coatings of lead on steel	Lead and/or copper			
Type ES		Lead	0.0010″ min		96 hr min
Type MS		Lead	0.00050″ min		48 hr min
Type PS		Lead	0.00025″ min		24 hr min
Type EES		Copper	0.000015″ min		96 hr min
		Lead	0.0010″ min		
Type MMS		Copper	0.000015″ min		48 hr min
		Lead	0.00050″ min		
Type PPS		Copper	0.000015″ min		24 hr min
		Lead	0.00025″ min		
B-253-53	Electroplating on aluminum alloys	Zinc immersion			None required
		Copper strike			
		Brass plating			
		Cadmium plating			
		Copper plating	3 mil max		
		Chromium plating	0.02–0.05 mil		
		Gold plating			
		Nickel plating	0.3–0.5 mil (1–2 mil when corrosion is present)		
		Silver plating			
		Tin plating			
		Zinc plating			
B-254-53	Electroplating on stainless steel	Nickel, Cadmium Copper, Brass, Gold, Silver	None specified		None required

Compiled by N. E. Woldman, Upper Montclair, N. J.

TABLE 20

CHARACTERISTICS OF ELECTRODEPOSITED COATINGS

DEPOSITS	Porosity	Hardness, Bhn	*Ductility	Tensile Strength, Psi; Also Pct Elongation	*Buffability	Pct Reflectivity (Buffed, Nearest Color)	Electric Conductivity Pct I.C.S.	Rate of Deposition (Min. to Deposit 0.0003 In.)
ALUMINUM OXIDE (Anodic) MIL A-8625	A	700 to 800	A	5 pct less than basis metal	B	60 to 78 pct	0 (dielectric)	20 min. (average)
BRASS	C	42 to 79	B	30,000 at 50 pct to 37,000 at 40 pct	A	55 to 60 pct. about equal to pale-green	26 to 43	Varies widely
CADMIUM	B	12 to 22	B	13,000 at 44 pct	C	85 pct, ivory	24	10 min at 20 amp per sq ft (tank); 30 min (barrel)
CHROMIUM	C	400 to 950	E	——	C	60 to 66 pct, sky-blue	13	18 min at 400 amp per sq ft; 2½ min at 200 amp per sq ft or 5 min at 100 amp per sq ft
COPPER (cyanide bath)	C	130 to 160	B	12,000 at 35 pct to 50,000 at 5 pct	B	55 pct, pale-green	100	17.4 min at 15 amp per sq ft for 0.0003 in.
COPPER (Rochelle bath)	C	130 to 160	B	12,000 at 35 pct to 50,000 at 5 pct	B	55 pct. pale-green	100	140° F, 6.6 min at 60 amp per sq ft; 11 min at 20 amp per sq ft (anode area twice cathode)
COPPER (acid sulphate)	D	40 to 62	B	10,000 at 40 pct to 40,000 at 3 pct	B	55 pct, pale-green	100	8 to 21 min
COPPER (bright bath, proprietary)	B	130 to 180	B	15,000 at 40 pct to 55,000 at 5 pct	A	55 pct, pale-green	100	6 min
CARRONIZING (proprietary)	A	200	B	——	D	Low	—	Generally operated 2 hr
GOLD	A	25 to 30	A	13,000 at 45 to 70 pct	A	78 pct, canary yellow	70	12 min at 20 amp per sq ft usual deposits 0.00075 in.
NICKEL (hard bath)	A	450	E	170,000 at 3 pct	C	55 pct, pale-green	16	8 min at 100 amp per sq ft; 15 min at 50 amp per sq ft
NICKEL (sulphate bath)	D	125 to 175	D	50,000 at 30 pct	C	55 pct, pale-green	16	100 min at 50 amp per sq ft
NICKEL (all chloride, proprietary)	A-B	220	C-D	100,000 at 30 pct	B	55 pct, pale-green	16	8 min at 50 amp per sq ft
NICKEL (hot Watts bath)	C	125 to 175	C	50,000 at 30 pct	C	55 pct, pale-green	16	10 min at 50 amp per sq ft
NICKEL (bright baths, proprietary)	A	300	C	30,000 at 35 pct	A	55 pct, pale-green	16	10 min at 50 amp per sq ft
PLATINUM	A	600 to 645	A	45,000 at 90 pct	A	78 pct, ivory	15	30 to 60 sec. usually deposits 0.000001 in.
RHODIUM	A	590 to 640	A	50 pct	A	78 pct, ivory	45	5 sec. for 0.000001 in.
SILVER (cyanide)	A	60 to 79	A	30,000 at 50 pct	A	85 to 95 pct white	103	9 min at 30 amp per sq ft
TIN (stannate)	D	8 to 9	D	——	B	82 pct, ivory	14	30 min at 25 amp per sq ft; 0.00075 in. usual thickness deposited
ZINC (cyanide bath)	C	40 to 60	A	17,000 at 17 pct	B	74 pct, canary yellow	28	11.4 min at 25 amp per sq ft; 5 min at 75 amp per sq ft

* Relative values: A as highest comparative value with declining values depicted down to D.

Table courtesy COLONIAL ALLOYS CO., Philadelphia.

TABLE 21

HOW TO STRIP METAL OVERLAYS

TABLE A—Quick Guide for Selecting Stripping Solutions

This table is for use with the listing of stripping solutions given in table B. The reference numbers given are the solution numbers of table B. For example, to strip chromium from steel, solutions 5 and 12 (from table below) may be used. The composition of solutions Nos. 5 and 12 are given in table B.

BASE METAL ➤ / METAL TO BE STRIPPED	COPPER	BRASS	STEEL	NICKEL	ZINC ALLOY	ALUMINUM ALLOY
ZINC	3	3	3, 9, 1	—	—	—
CADMIUM	2, 9, 24	2, 9, 24	2, 9, 1, 24	—	—	—
TIN	2, 10	2, 10	2, 5	—	—	—
LEAD	27	27	5, 27	—	—	—
CHROMIUM	—	3	5, 3, 12	3	—	21
NICKEL	—	6, 4	6, 7, 11	—	6	6
BRASS	—	—	1	—	—	—
COPPER	—	14	1, 13, 18	—	16, 18, 15, 17	19, 1
SILVER	—	20	1	—	—	—
GOLD	8, 25	8, 25	8, 1	—	28	—
PLATINUM	—	—	22	22	—	—
RHODIUM	—	23, 4	23, 4	23, 4	—	—

TABLE B—Solutions for Stripping Metal Overlays

Solution No.	SOLUTION	STRENGTH
1	Sodium cyanide	5 to 10 pct
	Voltage	2 to 6
2	Hydrochloric acid	20 to 30 pct
	Antimony trioxide	1 to 2 pct
3	Hydrochloric acid	5 to 15 pct
	Temperature	140 to 175°F
4	Hydrochloric acid	2 to 5 pct
	Voltage	2
5	Sodium hydroxide	5 to 10 pct
	Voltage	2 to 6
6	Sulfuric acid	67 pct
	Voltage	8 to 12
	Current density	100 amp per sq ft
	30 to 40 min per mil of Ni	
7	Sulfuric acid	65 pct
	Voltage	2
	Lead cathodes	
	Reference: Metal Industry, Vol. 66, 102 (1945)	
8	Sulfuric acid	98 pct
	Temperature below	100°F
	Anodic	
	Reference: U. S. Pat. 2,185,858	
9	Ammonium nitrate	10 to 15 pct
10	Ferric chloride	6 to 8 pct
	Copper sulfate	9 to 10 pct
	Acetic acid	30 to 50 pct
	Reactivate with hydrogen peroxide	
11	Nitric acid	70 pct
	Hydrochloric acid	0.1 pct
	Reference: U. S. Pat. 2,200,486	
12	Sodium carbonate	5 pct
	Temperature	150°F
	Current density	20 amp per sq ft
	Reference: Metal Industry, Vol. 65, 55 (1944)	
13	Chromic acid	35 pct
	Sulfuric acid	5 pct
14	Sodium sulfide	10 to 20 pct
	Sulfur	0.7 to 1.5 pct
	Boil to dissolve sulfur	
15	Sodium sulfide	8 pct
	Sulfur	3 pct
	Boil to dissolve sulfur	
	Temperature	185°F
	Reference: Trans. Electrochem. Soc. Vol. 77,210 (1940)	
16	Chromic acid	17 to 37 pct
	Ratio CrO:SO	100:1
	Temperature	68 to 77°F
	Current density	65 to 130 amp per sq ft
	Alternating current	50 to 60 cycle
	Reference: Trans. Electrochem. Soc. Vol. 77,207 (1940)	
17	Sodium sulfide	10 pct
	Voltage	2
18	Sodium hydroxide	9 pct
	Sulfur	14 pct
	Boil for 30 min to dissolve sulfur after treatment, spray treated zinc base with water to loosen the copper sulfide and dip in a sodium cyanide solution.	
	Reference: American Electroplaters' Soc. Conv. Proc. (1946)	
19*	Nitric acid	50 to 70 pct
20*	Nitric acid	1 volume
	Sulfuric acid	19 volumes
	Temperature	180°F
	Keep work dry entering solution.	
21*	Same as solution No. 16 but using anodic direct current in place of alternating current. Or an available chromium plating bath.	
	* Reference: W. R. Meyer, paper presented at Cleveland section, American Electroplaters' Society.	
22	Hydrochloric acid	2 volumes
	Nitric acid	1 volume
	Water	1 volume
	This solution will spontaneously decompose so that the life is short. It will also attack the base metal, but it may be used for thin deposits.	
23	Molten sodium cyanide	
	Temperature	1100°
24	Ammonium nitrate	8 to 12 pct
25	Sodium cyanide	10 pct
	Hydrogen peroxide (100 vol.)	3 pct
26	Ammonium hydroxide	5 volumes
	Hydrogen peroxide (100 vol.)	3 volumes
27	Acetic acid	5 volumes
	Hydrogen peroxide (100 vol.)	1 volume
	Water	14 volumes

Table by J. B. Mohler, New Castle, Pa.

TABLE 22

NICKEL IMMERSION COATING

SALT SPRAY RESISTANCE
Effect of Thickness

THICKNESS OF Ni IMMERSION	HEAT TREATMENT*	INITIAL RUST	50% CORRODED
0.0003″	yes	5 hr	48 hr
0.0003″	no	4 hr	140 hr
0.0005″	yes	8 hr	125 hr
0.0005″	no	6 hr	147 hr
0.0008″	yes	13 hr	213 hr
0.0008″	no	10 hr	213 hr

*All heat treated samples were heated at 850°F for one hour.

HUMIDITY RESISTANCE

COATING	INITIAL RUST SIGNS	GENERAL RUST	CONDITION AFTER CLEANING	RATING
CHROME—H.T. 1 hr @ 700°F	307 hr	—	Five deep pits	1
Ni IMMERSION —H.T. 1 hr @ 700°F	307 hr	—	10–15 fairly deep pits	2
Ni IMMERSION	235 hr	—	20–30 pits	3
NICKEL—H.T. 1 hr @ 700°F	43 hr	700	Many small pits	4
CHROME	43 hr	787	Many pits	5
NICKEL	19 hr	600	Many deep pits	6

Based on 100 pct relative humidity at 120°F for 787 hr.
All thicknesses are 0.0004 in. in above test series.

FATIGUE STRENGTH

SURFACE TREATMENT	FATIGUE STRENGTH, PSI*
GROUND	66,500
NICKEL PLATE	69,000
NICKEL IMMERSION, UNAGED	68,000
NICKEL IMMERSION, HEAT AGED	53,500
CHROMIUM PLATE	52,500

*At 10^8 cycles.
Material: Standard rotating beam fatigue specimen finish ground from AISI 4140 bar stock.

SALT SPRAY COMPARISON

COATING	INITIAL RUST	CONDITION AFTER 24 HR AFTER CLEANING	RATING
CHROME, H. T.	10 hr	2 pits	1
NI IMMERSION	5 hr	15 pits – 2 deep ones	2
NI IMMERSION, H. T.	7 hr	15 – 25 pits	3
CHROME	5 hr	20 – 30 pits	4
NICKEL. H. T.	7 hr	50 – 60 pits	5
NICKEL	5 hr	completely pitted	6

All thicknesses 0.0004 in. in above test series.
H. T. = Heat Treated. The heat treated samples were aged at 700°F for 1 hr before testing. Tests were run in 20 pct salt spray at room temperature.

COMPARATIVE WEAR TESTS
Based on Torsional Vibration

TYPE OF SURFACE TREATMENT	TOTAL RUNNING TIME (HOURS)	REMARKS
Ni IMMERSION, HEAT TREATED	37.75	Some evidence of corrosion on teeth. Very little wear from action of driven shaft teeth on coupling.
Ni IMMERSION, HEAT TREATED	16.45	Slight corrosion and very little wear.
HARD CHROME	23.75	Some corrosion. Some evidence of tooth wear.
HARD CHROME	7.15	Indications of wear from action of driven teeth on coupling.
Ni IMMERSION, UNTREATED	24	Considerable corrosion on coupling teeth. Some wear from driven teeth.
BRIGHT CHROME	22	Considerable corrosion. Chrome plate worn off from action of driven teeth on coupling.
DULL CHROME	23	

Tests of spline couplings under severe conditions; critical speed, 1390 rpm, with plus or minus 2° torsional input to shaft; output vibration amplitude plus or minus 10°.

Data on this page by A. E. Durkin,
GENERAL ELECTRIC CO.
(THE IRON AGE, July 8, 1954)

TABLE 23 NICKEL ELECTROPLATING

BASIS METAL	DECORATIVE	INDUSTRIAL	SEQUENCE OF PRETREATMENT OPERATIONS (See notes on facing page)
ALUMINUM	—	—	See note*.
BRASS	x	—	A-C-D-W-J-W
BRASS	—	x	A-C-B-W-L or O-W
CAST IRON, PLAIN	x	x	A-C-D-W-E 100 a.s.f. 5 min.—rapid W
CAST IRON, NI-RESIST	x	x	A-C-D-W-E 200 a.s.f. 5 min.—W
COPPER	x	—	A-C-D-W-K-W-H cold—W
COPPER	—	x	A-C-B-W-L-W
COPPER ALLOYS(17)	—	x	A-C-B-W-Q-W-R-W-S-W
INCONEL	x	x	A-C-D-W-M (See page 24)
MONEL	x	x	A-C-D-W-E 200 a.s.f. 5 min.—W
NICKEL, WROUGHT	—	x	A-C-B-W-D-W-E 20 a.s.f. 10 min., then 200 a.s.f. for 2 min., then cathodic 200 a.s.f. for 2-3 sec.—W
NICKEL, ELECTROLYTIC	x	x	A-C-D-W-T-W
NICKEL AND STEEL (together)	—	x	Same as for nickel, wrought
NICKEL-IRON ALLOYS	x	x	A-C-D-W-E 200 a.s.f. 5 min.—W
STEELS, CARBON	x	—	A-C-D-W-J-W
STEELS, CARBON	—	x	A-C-B-W-D-W-E 125 to 200 a.s.f. 5 min.—W
STEELS, NICKEL	x	x	A-C-D-W-E 200 a.s.f. 5 min.— (N optional)
STEEL, SAE 4340 (Cr-Ni-Mo)	x	x	A-C-D-W-E 200 a.s.f. 5 min.—W-M cathodic only—N (optional)
STEELS, STAINLESS	x	x	A-C-D-W-M (See page 24)
STEELS, TUNGSTEN	x	x	A-C-D-W-E 200 a.s.f. 5 min.—W-M cathodic only—N (optional)
TIN OR TINPLATE(18)	x	x	A-C-D one min.—W-P-W-O (dip only)—W
ZINC, DIE CASTING	—	—	Y

Where cost factors will permit, a pumice scrub should be incorporated, especially in plating large industrial units. This can be inserted immediately after the cathodic alkaline cleaning. After rinsing off the pumice in a free flowing water rinse tank, the next indicated operation is performed.

It is assumed that the basis metal has a smooth surface free of scale, tarnish defects at the start of the treatment listed. Rapid transfer from the last listed operation into the nickel plating bath is generally required.

* Aluminum processing does not lend itself to tabular treatment. For details see "Practical Nickel Plating," published by The International Nickel Co.

NICKEL ELECTROPLATING BATHS

TYPE OF BATH	oz./gal.	gm/L.	pH ELECTROMETRIC	TEMPERATURE F	NORMAL CATHODE CURRENT DENSITY (a.s.f.)
COLD					
Nickel Sulfate	16	120	5.0–5.5	room	5–10
Ammonium Chloride	2	15	—	—	—
Boric Acid	2	15	—	—	—
ELECTROTYPE					
Nickel Sulfate	9	70	5.6–6.0	90	10–20
Ammonium Chloride	0.7	5.5	—	—	—
WATTS—High pH					
Nickel Sulfate	32	240	4.5–5.6	115–120	20–100
Nickel Chloride	6	45	5.6–6.0	150–160	—
Boric Acid	4	30	—	—	—
WATTS—Low pH					
Nickel Sulfate	44	330	1.5–4.5	115–140	25–100
Nickel Chloride	6	45	—	—	—
Boric Acid	5	38	—	—	—
CHLORIDE					
Nickel Chloride	40	300	2	140	25–100
Boric Acid	4	30	—	—	—
CHLORIDE-SULFATE					
Nickel Sulfate	26	200	1.5	115	100
Nickel Chloride	23	175	—	—	—
Boric Acid	5.3	40	—	—	—
HARD NICKEL					
Nickel Sulfate	24	180	5.6–5.9	110–140	25–50
Ammonium Chloride	3.3	25	—	—	—
Boric Acid	4.0	30	—	—	—
BRIGHT NICKEL					
Nickel Sulfate	Proprietary	—	2.3–4.5	115–140	—
Nickel Chloride	—	—	—	—	—
Boric Acid + Brightening additions	—	—	—	—	—
BARREL					
Nickel Sulfate	20	150	5.0–5.5	75–90	—
Ammonium Chloride	4	30	—	—	—
Boric Acid	4	30	—	—	—
HIGH SULFATE—for plating on zinc					
Nickel Sulfate	13	100	5.3–5.8	70–90	10–35
Ammonium Chloride	4	30	—	—	—
Anhydrous Sodium Sulfate	13	100	—	—	—
Boric Acid	2	15	—	—	—
BLACK NICKEL					
Nickel Sulfate	10	75	5.6–5.9	120–130	5–20
Nickel Ammonium Sulfate	6	45	—	—	—
Zinc Sulfate	5	37	—	—	—
Sodium Thiocyanate	2	15	—	—	—

Table courtesy THE INTERNATIONAL NICKEL CO., New York.

Notes on Surface Preparation for Nickel Plating

A. Degrease. Remove non-saponifiable grease or oils with the aid of solvents.

B. Pumice scrub. Use fresh fine pumice powder. This absorbs greases and oils as well as causes some abrasion of metal surface. Do not re-use pumice.

C. Cathodic alkaline cleaning. Make work cathode in a commercial alkaline electrolytic cleaning solution held above 140° F. A bath composed of 3 oz. per gallon sodium hydroxide plus 2 oz. per gallon sodium carbonate is satisfactory for most work and numerous proprietary compounds are offered. Tank can be steel, anodes of steel or nickel. Current density and time are dependent upon the make-up of the cleaner and the quantity of dirt to be removed.

D. Anodic alkaline cleaning. Proprietary cleaners or the same composition given under C but with direction of current reversed. Time is dependent upon the type of work although it is usually much shorter than the cathodic cleaning.

E. Anodic sulfuric acid treatment. Solution contains 22 oz./gal. of 66° Baumé acid or 25% H_2SO_4 by weight. Use lead-lined or rubber-lined tank with lead cathodes and lead cooling coil to keep acid below 78° F. Current density generally 200 a.s.f., Time: 3 minutes after onset of passivity. The acid should be kept free of all copper ions.

F. Cathodic sulfuric acid treatment. Same as E but with work cathodic. Time: 2-3 seconds.

G. Sulfuric acid dip. Room temperature. 22 fl. oz. per gal. or 25% H_2SO_4 by weight. Same tank as E.

H. Sulfuric acid dip. 150° F. 7.7 fl. oz. per gal. of 66° Baumé acid or 10% H_2SO_4 by weight. Lead lined tank.

J. Hydrochloric (muriatic) acid dip. 150° F. Solution 19 fl. oz. per gal. muriatic acid or 6% HCl by weight. 30 seconds.

K. Sodium cyanide dip. 5% sodium cyanide by weight or 7 oz. per gal. Room temperature.

L. Nitric acid dip. Solution 64 oz. per gal. of 40° Baumé nitric acid or 35% HNO_3 by weight. Not over 80° F. Keep dip covered with activated carbon.

M.* Acid nickel chloride. Solution: Nickel chloride 32 oz./gal., Hydrochloric acid 11fl. oz./gal., Temperature 70° F., Current density 30 a.s.f., Electrodes nickel.

Ordinarily, work is anodic for two minutes and then current is quickly reversed so work is cathodic for six minutes. The presence of a flash of nickel thus obtained prevents the surface of the work from becoming passive as it is rapidly transferred to a plating solution. The short anodic treatment can be replaced by a longer soak (approximately 15 minutes) in the solution without current flow if current can't be reversed.

N. Heat treatment. This is not a pretreatment method but is included for convenience. Heavily nickel plated work is sometimes heated for two hours at 300-400° F to expel absorbed hydrogen and improve adhesion. This treatment can be conveniently done by immersion in a steel tank containing oil of high flash point.

O. Acid ammonium citrate solution treatment. Neutralize 50 grams citric acid with ammonium hydroxide, add 20 grams citric acid and dilute to 1 liter. In other units: neutralize 6.7 oz. citric acid with ammonium hydroxide, add 2.7 oz. citric acid excess and dilute to 1 gallon.

For polished brass, make the work anodic in the above solution at a current density of 10 a.s.f. for 30 seconds.

P. Cyanide copper plating. Use any commercial cyanide copper bath and deposit 0.0004-in. copper on the work.

Q. Etch work for 20-30 sec. at room temperature in a solution containing by volume: nitric acid (sp.gr. 1.42) 72 parts, sulfuric acid (sp.gr. 1.84) 434 parts, hydrochloric acid (sp.gr. 1.15) 1 part, and water—490 parts.

R. Dip in a solution containing about 26.7 oz./gal. sodium hydroxide and 0.27 oz./gal. potassium persulfate at room temperature for three minutes.

S. Dip for as short a time as possible in one per cent (by volume) sulfuric acid solution.

T. Treat as anode in a low pH Watts type or all-chloride nickel plating bath for three minutes at 10 a.s.f. Then reverse current and plate under normal conditions.

W. Cold water rinse or spray. Must be clean water running or replaced often.

Y. Care must be taken to attain a chemically clean surface without overcleaning and etching the zinc. Overcleaning is one of the greatest causes of plating rejects.

Normal procedure is to use a solvent degreaser or an emulsion slush cleaner to remove a high percentage of the buffing dope and other dirt usually trapped in the complex shapes. Parts are then immersed in a soak cleaner and then anodically cleaned, for a short period. Good inhibited proprietary cleaners prevent attack of the base metal and yet provide a clean surface. After alkaline cleaning, the article is water rinsed, etched slightly in 1% sulfuric acid and rinsed again. It is then copper plated or nickel plated using a "high sulfate" nickel solution. A minimum deposit of .0003-in. copper is necessary. The deposit of nickel from the "high sulfate" solution should be held below .0005 in.; it is advisable to limit it to .0002 in.

Z. Due to property of these metals to produce passive surface films, pretreatment must incorporate film removal and plating must take place before film sets up again. Some adhesion is obtained by subjecting the metal to severe muriatic acid pickling and then rapidly rinsing and transferring to the plating solution. Formation of the oxide film occurs very readily and since this procedure depends upon the rate of handling between the acid pickle and the plating solution, results are inconsistent. It is, therefore, advisable to use the acid nickel chloride solution.

The function of the anodic etch or the optional simple immersion is to remove the oxide film from the nickel surface. The reversal of the current produces a thin nickel film which prevents formation of a passive film while work is being transferred to the plating solution.

TABLE 24

Specification Plating

By C. B. F. Young
President, Auromet, Inc.
and Consultant
Leonia, N. J.

These tables show the estimated time to produce a given deposit thickness at a known current density.

The brass table calculations were based on certain assumptions. A 70-pct copper, 30-pct zinc alloy was selected. The electrochemical equivalent was calculated by taking 70 pct of the electrochemical equivalent of copper and adding to it 30 pct of the electrochemical equivalent of zinc. This gives a value of 0.0005629 g per coulomb as the electrochemical equivalent.

Calculations in each table are based on the fact that, for a given thickness, a definite amount of metal will be deposited per unit area. This amount can be determined if the density is known. In all cases, the weight of deposit which occupies the space of 0.000083 cu ft was found, but cubic centimeters were used because they were more practical.

Calculations were based on a cathode efficiency of 100 pct, i. e., all the current passing from the solution to the cathode reduced the theoretical amount of metal. For every 96483.7 coulombs of electricity passing through the cell, an equivalent weight of metal will be reduced. However, this is not true in most cases. Generally, the best cathode efficiency is about 90 to 95 pct.

In many cyanide baths, cathode efficiency may be as low as 50 to 60 pct. A chromium bath gives the lowest efficiency of all, about

GOLD

AU+

Electrochemical equivalent = 0.0020436
Density = 19.32
Weight = $0.00254 \times 6.4432 \times 144 \times 19.32 = 45.51$ gm.

$$\frac{45.51}{1 \times .0020436} = 22{,}221 \text{ sec.} = 370 \text{ min.} = 6.20 \text{ hr.}$$

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.002	0.003
1	*37	**1-14	1-51	2-28	3-5	3-42	4-19	4-56	5-32	6-10	12-20	18-30
5	7	15	22	30	37	44	52	59	1-7	1-14	2-28	3-42
10	4	7	11	15	18	22	26	30	33	37	1-14	1-51
15	2	5	7	10	12	15	17	20	22	25	50	1-14
20	2	4	6	7	9	11	13	15	17	19	37	56
25	1	3	4	6	7	9	10	12	13	14	30	44
30	1	2	4	5	6	7	9	10	11	12	24	36
35	1	2	3	4	5	6	7	8	9	11	22	33
40	1	2	3	4	5	6	6	7	8	9	18	27
45	0.8	2	2	4	4	5	6	6	7	8	16	25
50	0.7	1	2	3	4	4	5	6	7	7	15	22
gm. per sq. ft.	4.55	9.12	13.62	18.20	22.70	27.22	31.80	36.40	41.00	45.51	91.02	136.53
Avoir. oz. per sq. ft.	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60	3.20	4.80
Troy oz. per sq. ft.	0.15	0.29	0.44	0.59	0.73	.088	1.02	1.17	1.32	1.47	2.94	4.40
$ gold† per sq. ft.	5.25	10.15	15.40	20.62	25.28	30.80	35.70	41.00	46.20	51.49	102.98	154.47

† All figures based on the cost of gold at $35.00 per troy oz.
* read, 37 min.
** read, 1 hr. 14 min.

BRASS

70-30

Zn++ 0.000339 × 30 per cent = 0.0001017
Cu+ 0.0006588 × 70 per cent = 0.0004612
Electrochemical equivalent 0.0005629
Density = 8.5
Weight = $0.00254 \times 929.988 \times 8.5 = 20.02$ gm.

$$\frac{20.02}{0.005629} = 35{,}580 \text{ sec.} = 593 \text{ min.} = 9.88 \text{ hr.}$$

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.002	0.003
1	59	*1-59	2-58	3-57	4-56	5-55	6-55	7-54	8-54	9-53	19-46	29-39
5	12	24	36	47	59	1-11	1-23	1-35	1-47	1-59	3-57	5-56
10	6	12	18	24	30	36	42	47	53	59	1-59	2-58
15	4	8	12	16	20	24	28	32	36	40	1-20	1-59
20	3	6	9	12	15	18	21	24	27	30	1-0	1-29
25	2	5	7	9	12	14	17	19	21	24	47	1-11
30	2	4	6	8	10	12	14	16	18	20	40	59
35	2	3	5	7	9	10	12	14	15	17	34	51
40	1	3	4	6	7	9	10	12	13	15	30	45
45	1	3	4	5	7	8	9	10	12	13	26	39
50	1	2	4	5	6	7	8	9	11	12	23	35
gm. per sq. ft.	2.00	4.00	6.00	8.00	10.01	12.01	14.01	16.02	18.02	20.02	40.04	60.06
oz. per sq. ft.	0.07	0.14	0.21	0.28	4.35	0.42	0.49	0.57	0.64	0.71	1.42	2.13

* read, 1 hr. 59 min.

SILVER

Ag+

Electrochemical equivalent = 0.001118 gm. per coulomb.
Density = 10.50.
Weight = 0.00254 × 929.088 × 10.50 = 24.78 gm.
24.78 divided by 0.001118 = 22920 sec. = 382 min. = 6.2 hr.

C.D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.003
1	38	*1-16	1-54	2-33	3-11	3-49	4-27	5-5	5-44	6-22	12-44	19-6
5	8	15	23	30	38	46	53	1-1	1-9	1-16	2-35	2-48
10	4	8	11	15	19	23	27	30	34	38	1-16	1-55
15	3	5	8	11	13	15	18	20	23	25	51	1-16
20	2	4	6	8	10	11	13	15	17	19	38	57
25	2	3	5	6	8	9	11	12	14	15	31	46
30	1	3	4	5	6	8	9	10	11	12	25	38
35	1	2	3	4	6	7	8	9	10	11	22	34
40	1	2	3	4	5	6	7	8	9	10	19	29
45	1	2	3	3	4	5	6	7	8	9	17	25
50	1	2	2	3	4	5	5	6	7	8	15	23
gm. per sq. ft.	2.48	4.95	7.42	9.90	12.38	14.82	17.30	19.80	22.22	24.78	49.50	74.20
oz. per sq. ft.	0.09	0.18	0.26	3.50	0.43	0.53	0.61	0.70	0.79	0.87	1.75	2.62

* read, 1 hr. 16 min.

TIN

Sn++++

Electrochemical equivalent = 0.0003083 gm. per coulomb.
Density = 7.3.
Weight = 0.00254 × 929.088 × 7.3 = 17.20 gm.
17.20 divided by 0.0003083 = 5582 sec. = 928 min. = 15.48 hr.

C.D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.003
1	*1-33	3-6	4-39	6-12	7-45	9-18	10-51	12-24	13-57	15-28	30-56	46-24
5	19	37	55	1-14	1-33	1-51	2-9	2-28	2-46	3-5	6-11	9-17
10	9	19	28	37	46	56	1-5	1-14	1-24	1-33	3-5	4-38
15	6	12	19	25	31	38	44	50	57	1-3	2-5	3-8
20	5	9	14	19	23	28	32	37	42	46	1-33	2-19
25	4	7	11	15	19	22	26	30	33	37	1-14	1-51
30	3	6	9	12	15	19	22	25	28	31	1-2	1-33
35	3	5	8	11	13	16	19	21	24	26	53	1-20
40	2	5	7	9	12	14	16	19	21	23	46	1-10
45	2	4	6	8	10	12	14	17	19	21	41	1-2
50	2	4	6	7	9	11	13	15	17	19	37	56
gm. per sq. ft.	1.72	3.44	5.16	6.88	8.60	10.32	12.03	13.75	15.49	17.20	34.40	51.60
oz. per sq. ft.	0.06	0.12	0.18	0.24	0.30	0.37	0.43	0.49	0.55	0.61	1.21	1.82

* read, 1 hr. 33 min.

TIN

Sn++

Electrochemical equivalent = 0.0006166 gm. per coulomb.
Density = 7.3.
Weight = 0.00254 × 929.088 × 7.3 = 17.20 gm.
17.20 divided by 0.0006166 = 2791 sec. = 464 min. = 7.74 hr.

C.D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.003
1	46	*1-33	2-19	3-5	3-51	4-38	5-24	6-10	6-57	7-44	15-28	23-12
5	9	19	28	37	46	56	1-5	1-14	1-24	1-33	3-5	4-38
10	5	9	14	19	23	28	32	37	42	46	1-33	2-18
15	3	6	9	12	15	19	22	25	28	31	1-2	1-33
20	2	5	7	9	12	14	16	19	21	23	46	1-10
25	2	4	6	7	9	11	13	15	17	19	37	56
30	2	3	5	6	8	9	11	12	14	15	31	47
35	1	3	4	5	7	8	9	11	12	13	26	40
40	1	2	3	5	6	7	8	9	10	12	23	35
45	1	2	3	4	5	6	7	8	9	10	20	31
50	1	2	3	4	5	6	7	7	8	9	18	28
gm. per sq. ft.	1.72	3.44	5.16	6.88	8.60	10.32	12.03	13.75	15.49	17.20	34.40	51.60
oz. per sq. ft.	0.061	0.121	0.18	0.24	0.30	0.37	0.43	0.49	0.55	0.61	1.21	1.82

* read, 1 hr. 33 min.

ZINC

Zn++

Electrochemical equivalent = 0.000339 gm. per coulomb.
Density = 7.1.
Weight = 0.00254 × 929.088 × 7.1 = 16.72 gm.
16.72 divided by 0.000339 = 49200 sec. = 820 min. = 13.6 hr.

C.D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.003
1	*1-22	2-44	4-6	5-28	6-50	8-18	9-34	10-56	12-18	13-40	27-20	41
5	16.4	33	49	1-6	1-22	1-38	1-54	2-12	2-27	2-44	5-28	8-12
10	8.2	16	24	32	41	49	57	1-5	1-13	1-22	2-44	5-28
15	5.5	11	16	22	27	33	38	44	49	55	1-50	2-45
20	4	8	12	16	20	25	29	33	37	41	1-22	2-3
25	3.3	7	10	13	17	20	23	26	29	32	1-5	2-10
30	2.7	5	8	11	14	16	19	22	24	27	54	1-21
35	2.3	4	7	9	11	14	16	18	21	23	46	1-9
40	2	4	6	8	10	12	14	16	18	20	41	1-2
45	1.8	4	5	7	9	11	13	14	16	18	36	55
50	1.6	3	5	6	8	10	11	13	14	16	33	49
gm. per sq. ft.	1.67	3.34	5.01	6.7	8.35	10.03	11.70	13.38	15.02	16.72	33.44	50.16
oz. per sq. ft.	0.059	0.188	0.177	0.236	0.295	0.354	0.413	0.472	0.531	0.590	1.180	1.770

* read, 1 hr. 22 min.

13 or 14 pct. It is therefore essential that these values be corrected for the plating losses by determining cathode efficiency.

Assuming cathode efficiency to be 90 pct for a zinc bath, 10 pct of the current passing through did not deposit zinc. Thus, the calculations are off by 10 pct and 10 pct more time is necessary for the plating operation than that which is shown in the tables.

The element valence, electrochemical equivalent and density of the metal are given above each table. From these data, the weight of metal occupying 1 sq ft of surface 0.001 in. thick is calculated.

The time necessary to deposit this amount at a given current density is determined and is placed in its proper position in the table. The first figure appearing in each square denotes the time in hours, while the second denotes the time in minutes.

The two bottom rows in each table give the weight per square foot of metal for the different thicknesses.

Nine Ways to Check Deposit Thickness

Microscope method—The methods for checking deposit thickness are: One of the most accurate methods of checking because actual plate thickness is seen through a microscope equipped with an eye piece calibrated for exact measurement. A section of the plated object is cut perpendicular to the deposit to get a true thickness.

After cutting, the article is then mounted in a low-melting alloy, plastic, or a similar substance, and polished and etched. The sample is then placed under the microscope and brought into focus. If the microscope has a micrometer eyepiece, the thickness of the deposit can be read directly.

Measle chord method—Depends on filing a curved surface until the base metal is exposed, then measuring the length of the file

Continued

mark. If the object is flat, a precision grinding wheel is used until the base metal is reached and the length of the grind mark is measured. In either case, the thickness can be obtained by using the formula:

$$\text{Thickness} = \frac{C^2}{8R}$$

C=length of cut
R=radius of the grinding wheel or object.

The radius of the grinding wheel can be measured directly. The radius of a curved surface can be measured with a spherometer.

Micrometer method — Consists of obtaining the thickness of several pieces before plating, then plating the pieces and again checking them for thickness. An alternate method is to plate the object and obtain its thickness by micrometer, then strip the deposit and recheck the thickness.

Induction method — Originally developed for organic or nonconductive coatings, it can be used to calibrate metallic coating thicknesses. The apparatus consists of a coil of wire around a laminated steel core which is closed on all sides except one. The coil is connected to a source of current and a galvanometer that is enlarged by an amplifying system. Current flowing through the coil is measured by a sensitive galvanometer. Any change in current flow is immediately registered.

The electrical circuit is closed and the flow of current through it can be varied only by changing the magnetic flux. This is done by bringing the open side of the lamination near a metallic body such as steel. When the steel is brought near, a definite deflection occurs. If the steel is covered with zinc, cadmium, brass, or other metal, the coating insulates the steel from the laminated core which affects the deflection of the

Continued on page F-32

COPPER

Cu+

Electrochemical equivalent = 0.0006588.
Density = 8.93.
Weight = 0.00245 × 929.088 × 8.93 = 21.00 gm.
21.00 divided by 0.0006588 = 31,990 sec. = 534 min. = 8.9 hr.

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.00
1	53	*1-47	2-41	3-35	4-29	5-22	6-16	7-10	8-4	8-54	17-49	26-4
5	11	21	32	43	54	1-4	1-15	1-26	1-36	1-47	3-34	5-2
10	5	11	16	22	27	32	38	43	49	54	1-48	2-4
15	4	7	11	14	18	21	25	28	32	36	1-12	1-4
20	3	5	8	11	13	16	19	21	24	27	54	1-2
25	2	4	6	9	11	13	15	17	19	21	43	1-1
30	2	4	5	7	9	11	12	14	16	18	36	
35	2	3	5	6	8	9	11	12	14	15	30	
40	2	3	4	5	7	8	9	11	12	13	26	
45	1	2	4	5	6	7	8	9	11	12	23	
50	1	2	3	4	5	6	7	9	10	11	21	
gm. per sq. ft.	2.10	4.20	6.30	8.40	10.50	12.60	14.70	16.80	18.90	21.00	42.00	63.0
oz. per sq. ft.	0.07	0.15	0.22	0.29	0.40	0.44	0.51	0.59	0.66	0.74	2.20	2.2

* read, 1 hr. 47 min.

COPPER

Cu++

Electrochemical equivalent = 0.0003294 gm. per coulomb.
Density = 8.93.
Weight = 0.00254 × 929.088 × 8.93 = 21.00 gm.
21.00 divided by 0.0003294 = 63,980 sec. = 1068 min. = 17.8 hr.

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.00
1	*1-47	3-34	5-21	7-8	8-55	10-44	12-30	14-15	16-2	17-48	35-36	53-2
5	21	42	1-4	1-25	1-47	2-8	2-29	2-50	3-12	3-34	7-8	10-4
10	11	21	32	43	53	1-4	1-15	1-26	1-36	1-47	3-34	5-2
15	7	14	21	28	36	43	50	57	1-4	1-11	2-22	3-3
20	5	11	16	21	27	32	37	43	48	53	1-47	2-4
25	4	9	13	17	21	26	30	34	39	43	1-26	2-0
30	4	8	11	14	18	21	25	29	32	36	1-12	1-4
35	3	6	9	12	15	18	21	24	28	31	1-2	1-3
40	3	5	8	11	13	16	19	21	24	27	54	1-2
45	2	5	7	10	12	14	17	19	21	24	48	1-1
50	2	4	6	9	11	13	15	17	19	21	43	1-0
gm. per sq. ft.	2.10	4.20	6.30	8.40	10.50	12.60	14.70	16.80	18.90	21.00	42.00	63.0
oz. per sq. ft.	0.07	0.15	0.22	0.29	0.40	0.44	0.51	0.59	0.66	0.74	1.47	2.2

* read, 1 hr. 47 min.

NICKEL or COBALT

Ni++
Co++

Electrochemical equivalent (Ni++) = 0.0003054 gm. per coulomb.
(Co++) = 0.0003040 gm. per coulomb.
As there is only 3 per cent difference all calculations are based on Ni
Density = 8.75.
Weight = .00254 × 929.088 × 8.75 = 20.61.
20.61 divided by 0.0003054 = 67,820 sec. = 1132 min. = 18.8 hr.

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.00
1	*1-53	3-47	5-41	7-34	9-20	11-12	13-4	14-50	16-48	18-52	37-44	56-3
5	22	45	1-7	1-30	1-52	2-15	2-37	2-59	3-21	3-42	7-24	11-0
10	11	26	34	45	57	1-8	1-19	1-30	1-42	1-53	3-46	5-3
15	7	15	23	30	38	45	53	1	1-8	1-15	2-31	3-4
20	6	11	17	23	28	34	40	45	51	56	1-53	2-5
25	5	9	14	18	23	27	32	36	41	45	1-31	2-1
30	4	7	11	15	19	23	26	30	34	38	1-15	1-5
35	3	6	10	13	16	19	23	26	29	32	1-5	1-3
40	3	6	8	11	14	17	20	23	25	28	57	1-2
45	3	5	8	10	13	15	18	20	23	25	50	1-1
50	2	5	7	9	11	14	16	18	20	23	45	1-0
gm. per sq. ft.	2.06	4.12	6.18	8.25	10.31	12.38	14.45	16.50	18.55	20.61	41.22	61.8
oz. per sq. ft.	0.071	0.15	0.218	0.29	0.36	0.44	0.51	0.58	0.66	0.73	1.46	2.1

* read, 1 hr. 53 min.

CADMIUM

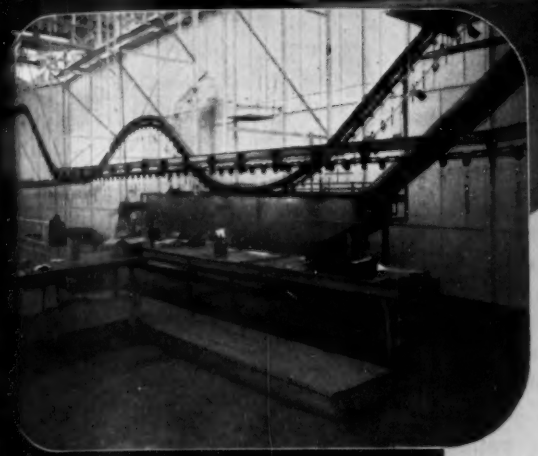
Cd++

Electrochemical equivalent = 0.0005824 grams per coulomb.
Density = 8.65.
Weight = 0.00254 × 929.088 × 8.65 = 20.19 gm.
20.19 divided by 0.0005824 = 34999 sec. = 582 min. = 9.7 hr.

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.00
1	58	*1-56	2-54	3-52	4-50	5-48	6-46	7-44	8-42	9-40	19-20	29-0
5	12	23	35	46	58	1-10	1-21	1-33	1-44	1-56	3-52	5-4
10	6	12	17	23	29	35	41	46	52	58	1-56	2-5
15	4	8	12	16	20	23	27	31	35	39	1-18	1-5
20	3	6	9	12	15	18	21	23	26	29	58	1-2
25	2	5	7	9	11	14	16	18	21	23	47	1-1
30	2	4	6	8	10	12	14	16	17	19	39	
35	2	3	5	7	8	10	12	13	15	16	33	
40	1	3	4	6	7	9	10	12	13	15	29	
45	1	3	4	5	7	8	9	10	12	13	26	
50	1	2	3	5	6	7	8	9	10	11	23	
gm. per sq. ft.	2.02	4.04	6.06	8.08	10.10	12.12	14.14	16.16	18.18	20.19	40.38	60.5
oz. per sq. ft.	0.07	0.14	0.21	0.29	0.36	0.43	0.50	0.57	0.64	0.71	1.42	2.1

* read, 1 hr. 56 min.

Dual Cincinnati FINISHING SYSTEMS



AUTOMATIC PAINT DIP and CHROMODIZER OPERATIONS:

lkaline Clean
st Rinse
assivate
nd Rinse
ot Air Blow-Off

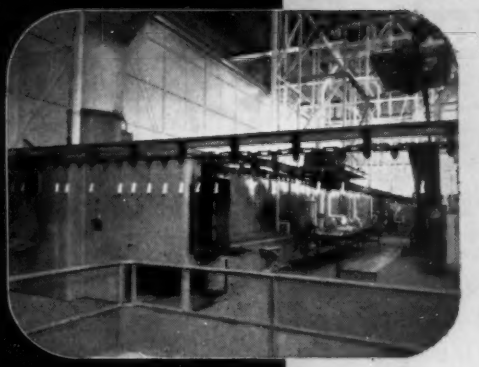
All parts receive this treatment, some then go to assembly.

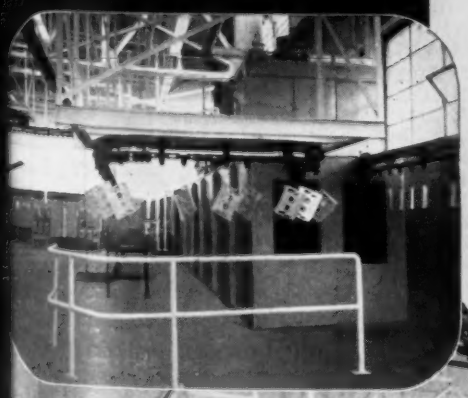
aint Dip
ven Bake

Other parts are painted on conveyor.

ripper
nse

For empty conveyor hangers.





save 60% in time

...for noted aircraft manufacturer

A double conveyor line cleaning and paint finishing system in a well known mid-western aircraft plant handles all sorts of formed aluminum parts up to 15" x 20" in size. Moving at 18 feet per minute, the conveyors carry the parts through the various operations, removing grease, oil and chips prior to painting and assembly.

Among interesting design features: The arrangement of the system around the outer perimeter of the room, leaves the center clear for storage and loading and unloading operations. The zinc chromate dip tank has a refrigeration system to maintain tank temperature at 74° F., reducing evaporation of volatiles. The system is protected with CO_2 equipment and automatic paint tank dump.

As was done in this installation, Cincinnati Engineers will gladly design equipment to suit your needs. Whatever your cleaning or finishing problems, a survey costs you nothing, may point the way to substantial savings. Write today for booklet: "Finishing Systems."

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CLEANING & FINISHING MACHINERY CO., INC.

2017 HAGEMAN STREET, SHARONVILLE, OHIO

galvanometer. This deflection depends upon the thickness of deposit.

Drop test method—A standard solution is dropped on the article to be tested at the rate of 80 to 120 drops per minute until the deposit is dissolved by chemical action and the base metal is exposed. The time to accomplish this is noted in seconds, each second being equivalent to 0.00001 in. of deposit thickness. Standard solutions are:

	g. per liter	oz. per gal.
For Zinc:		
Ammonium nitrate NH_4NO_3	100	13.33
Concentrated nitric acid HNO_3	75	.10
For cadmium:		
Ammonium nitrate NH_4NO_3	110	14.67
Concentrated hydrochloric acid HCl	13.7	1.83

The drop method is inexpensive to install and operate. Its accuracy is good enough for average shop plating of zinc and cadmium.

Jet method—Although not in general use now, it has been applied to copper, nickel, bronze, cadmium and zinc with good results. It uses a steady stream of solution impinging on the plated surface instead of successive drops. Coatings of commercial thicknesses require 1 to 2 min for penetration. Accuracy is about 15 pct. Only the coating is destroyed and the object be repleted easily.

Apparatus consists of a burette having a capacity of 100 cc. The orifice should be adjusted so 10 cc of water pass through in 30 sec. To maintain uniform flow, a reservoir bottle is connected so that the head of liquid is constant at all times.

The surface to be tested must be free of grease and chromium.

The object to be tested is clamped about ¼ in. below the jet at a 45° angle. The stream of liquid and a stop watch are started simultaneously and allowed to proceed for 5 to 10 sec. The spot is then examined. This is repeated without removing the last piece until penetration below the jet is observed. The time required to accomplish this is compared to the time necessary for the same solution to penetrate the same coating 0.001 in. thick.

The solutions used depend on the coating being tested. For nickel, a solution containing ferric chloride, cupric sulfate and acetic acid is used. At 68°F, 0.0001 in. is removed in 11 sec.

	g. per liter	ox. per gal.
Ferric chloride $FeCl_36H_2O$	100	13.33
Cupric sulfate $CuSO_45H_2O$	250	33.44
Acetic acid $HC_2H_3O_2$	250	35.41

Spot method—Used for chromium deposits too thin to be determined by the microscope or chord method. It consists of placing a drop of concentrated hydrochloric acid on the chrome deposit and timing the period of gassing. At 70°F, each second is equivalent to 0.000001 in.

Since it depends on the chromium going into solution, the metal surface must be clean and in the active state. If the metal is dirty or passive, the chromium will not react as readily and will give too high a result.

Chemical strip method—It is generally conceded to be the standard method. It is accurate but time consuming and a technique is required. The method may be modified so that it is similar to the micrometer method in that the material thickness is determined with a micrometer, then stripped. The thickness is again taken and the difference is the coating thickness.

The object can also be weighed before plating. After plating, the object is reweighed and the difference is the weight of the deposit. If the density of the plate is known, the thickness can be calculated from the weight.

The best method of checking thickness is to strip off the deposit in a solution of known volume, then determine the amount of the deposit in the stripping agent by chemical means. The plated thickness can be calculated from the weight if the density is known.

A thickness indicator developed at the National Bureau of Standards is being used in industry for checking the thickness of nickel deposits on non-magnetic base metals. The nickel, being magnetic, exerts a pull on the magnet which is directly proportional to the deposit thickness.

One method of applying the test is to suspend the magnet from a spring attached to a dial. After the magnet is placed on the nickel coating, a pull is exerted on the magnet by turning the dial. When the magnet breaks away, a direct thickness reading can be obtained if the scale is calibrated. The apparatus is expensive, but it gives results quickly and does not injure the coating.

CHROMIUM 6+

Electrochemical equivalent = 0.0000898.
Density = 6.92.
Weight = 0.00254 × 929.088 × 6.92 = 16.32 gm.
16.32 divided by 0.0000898 = 181998 sec. = 3033 min. = 50.5 hr.

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.001	0.002	0.003
1	*5-4	10-8	15-12	20-16	25-20	30-24	35-28	40-32	45-36	50-36	101-12	151-48
5	1-1	2-2	3-2	4-3	5-5	6-6	7-7	8-8	9-9	10-9	20-18	30-27
10	31	1-2	1-33	2-4	2-35	3-6	3-37	4-8	4-39	5-4	10-8	15-12
15	20	40	1-1	1-21	1-42	2-1	2-22	2-42	3-2	3-22	6-44	10-6
20	15	30	45	1-0	1-16	1-31	1-46	2-1	2-1	2-32	5-4	7-36
25	12	24	36	49	1-1	1-13	1-25	1-37	1-49	2-1	4-3	6-4
30	10	20	30	40	51	1-1	1-11	1-21	1-31	1-41	3-22	5-3
50	6	12	18	24	31	37	43	49	55	1	2	3
75	4	8	12	16	20	24	28	32	36	40	1-21	2-1
100	3	6	9	12	15	18	21	24	26	30	1-1	1-31
150	2	4	6	8	10	12	14	16	18	20	40	1-21
175	2	3	5	7	9	10	12	14	15	17	35	52
200	2	3	5	6	8	9	11	12	14	15	30	46
gm. per sq. ft.	1.63	3.26	4.88	6.51	8.15	9.76	11.40	13.01	14.65	16.32	32.64	48.92
oz. per sq. ft.	0.058	0.12	0.17	0.23	0.29	0.35	0.40	0.46	0.52	0.58	1.15	1.73

TABLE 25 | CHROMIUM PLATING PROPERTIES

Among the physical properties of electrodeposited chromium is the unique combination of extreme hardness with a low co-efficient of friction, high melting point and an unusual ability to adhere to certain basis metals when properly applied.

HARDNESS

Comparative Hardness of Metals (Moh's Scale)

Lead	1.5
Tin	1.8
Cadmium	2.0
Zinc	2.5
Gold	2.5
Silver	2.7
Aluminum	2.9
Copper	3.0
Nickel	3.5
Platinum	4.3
Iron	4.5
Cobalt	5.5
Tungsten	7.5
Chromium	9.0

Variations in Brinell Hardness of Electrodeposited Metals

Cadmium	12 to 53
Zinc	40 to 50
Silver	61 to 130
Copper	58 to 150
Iron	167 to 350
Nickel	155 to 420
Cobalt	270 to 311
Chromium	570 to 1250

Attempts to measure the hardness of chromium plate by standard Brinell, Rockwell, or Scleroscope instruments generally give low results. The most reliable results based on "scratch hardness" determinations using special diamond point equipment show that the type of chromium deposits generally used for industrial applications have a hardness equivalent to about 1,000 Brinell.

The chart above shows that while chromium is much harder than the other metals listed, there is a considerable variation in its Brinell hardness. The conditions under which chromium is plated as well as the heat treatment to which the coatings are subsequently subjected influence the hardness.

FRICTIONAL PROPERTIES

Comparative Static Friction of Surfaces

Babbitt on Babbitt	100
Steel on Steel	55
Steel on Babbitt	44
Steel on Chromium	29
Chromium on Chromium	23

Many liquids, including water and even molten metals, do not readily wet a chromium surface. A somewhat similar effect may be observed when a chromium plated surface comes in contact with metals or other solids. For instance, the chips literally fly away from a chromium plated rotary file. There is no loading of the file teeth. A chromium plated surface has very little tendency to seize, gall or cold weld to the surface of another metal when the two are rubbed together under pressure. This non-galling property is of especial value when dealing with the chip bearing surface of a cutting tool and the wearing surface of a forming tool.

THERMAL EXPANSION

Coefficient of Linear Expansion from 70° to 570° x 10^{-6}

Glass, Pyrex	3.2
Cast Iron, Nickel	7.3
Cast Iron, Gray	7.4
Chromium	8.1
Glass, Plate	8.9
Steel S.A.E. 1025	13.2
Nickel	14.0
Nickel Silver 18%	16.0
Copper	17.6
Bronze	18.8
Brass, Red	19.1
Brass, Yellow	20.5
Aluminum	25.7
Zinc, Die Cast	27.7

Experience shows that properly applied chromium plate remains adherent on tools subject to such drastic temperature changes as occur in the operation of forging dies and plastic molds.

RADIANT EMISSIVITY

Normal Total Emissivity at 440°F

Gold	0.018
Silver Polished	0.020
C. & L.C. Chromium	0.025
Copper Polished	0.030
Aluminum Polished	0.040
Platinum	0.054
Nickel Plate Polished	0.070
Brass Polished	0.096
Aluminum Oxidized	0.120
Brass Dull	0.220
Cast Iron Polished	0.221
Nickel Plate Oxidized	0.370
Stainless 18/8 Oxidized	0.440
Copper Oxidized	0.570
Cast Iron Oxidized	0.640

The normal total emissivity of radiant energy varies considerably with the temperature. At a temperature of 440°F the emissivity of chromium plate approximates those of polished silver, copper and aluminum. It is much lower than those of other commonly used metals, whether their surfaces be polished or oxidized.

THERMAL CONDUCTIVITY

Thermal Conductivity @ 212°F

18/8 Stainless	0.061
Lead	0.083
Steel (mild)	0.107
Cast Iron	0.116
Nickel	0.140
Tin	0.140
Platinum	0.173
Brass	0.247
Zinc	0.264
Aluminum	0.490
C. & L.C. Chromium	0.650
Gold	0.702
Copper	0.901
Silver	1.083

The thermal conductivity of chromium, as calculated from the electrical resistivity, is fairly high exceeding the thermal conductivities of the commonly used metals and alloys with the exceptions of copper, silver and gold.

Want Extra Copies?

A limited number of extra copies of this special feature will be available upon request to Readers' Service Dept., The Iron Age, 100 E. 42nd St., New York 17, N. Y.

Data for these tables courtesy UNITED CHROMIUM, INC., New York

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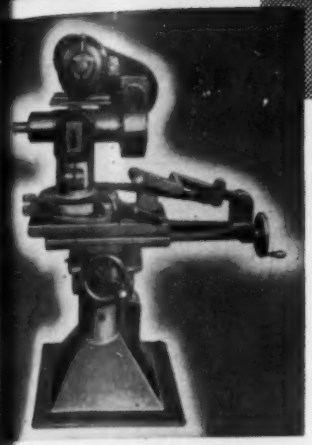

ACME *Semi-Automatics*

Acme Semi-Automatic Polishing and Buffing Machines are available in a wide range of types and spindle arrangements.
LEFT—Acme Type B-10, single spindle.
RIGHT—Acme Type L4, four spindle, an automatic indexing machine.
Acme "Semi's" meet production and finish demands on a great variety of parts. Their efficiency and dependability has been fully demonstrated in industry.

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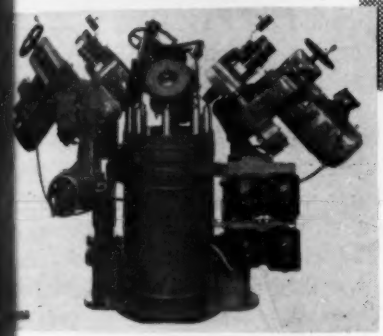
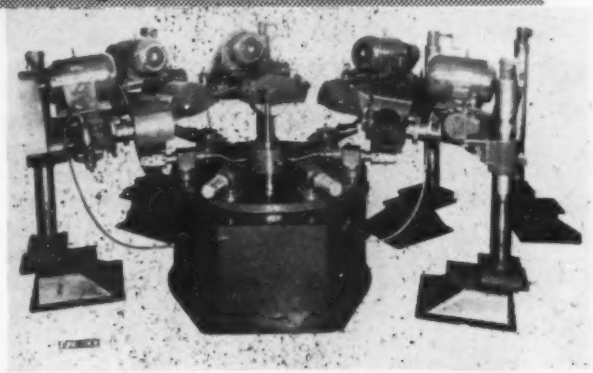


ACME *Rotary Automatics*

Acme Rotary Automatics are furnished with Indexing and Continuous table operation. They are available with table sizes from 18 inches to 24 feet diameter and are outstanding production machines.



ABOVE—Acme Type L-8-L Rotary with variable speed control with less than one second index interval. Unusually efficient for finishing small parts.
RIGHT—Acme 66 inch, 7 station indexing rotary with right angle attachment illustrating one of many efficient Acme arrangements of these versatile units.

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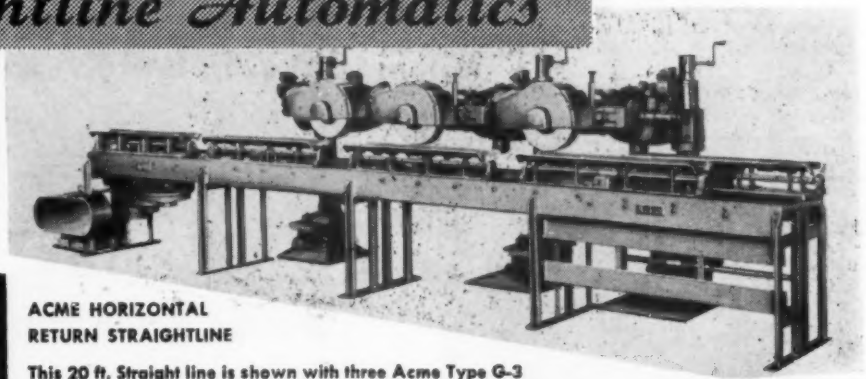

ACME HORIZONTAL RETURN STRAIGHTLINE

This 20 ft. Straight line is shown with three Acme Type G-3 adjustable floating head polishing and buffing lathes. It can be increased in length to 80 ft. by adding standard 10 ft. sections.

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Please send blue prints or finished and unfinished samples of part to be finished with detailed information on present finishing operation and production requirements. Recommendations and quotations will be furnished.

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Metal Cleaning:

Factors to be considered In analyzing a cleaning job.

By R. W. Mitchell
Vice President
Magnus Chemical Co.
Garwood, N. J.

Any metal cleaning or relate problem is governed by three de ciding factors:

A. Factors affecting the sele tion of the cleaning *materials*. Such factors are mainly influence by the *nature of the dirt* to be re moved, and by the susceptibility o the work to chemical attack. Th quality of results is also a factor— whether chemically clean, or onl physically clean; whether the wor should come from the process we or dry, or coated with anti-rustin oil film, or with a phosphatized film for paint bonding.

B. Factors affecting the sele tion of the cleaning *method:* These are influenced by the nature of the dirt, plus the *nature of the work* t be cleaned—size, shape, fragility whether processed in bulk or indi vidually or racked.

C. Factors affecting the sele tion of the cleaning *equipment*. These are also influenced by the tion of the cleaning *equipment* nature of the dirt and the nature of the work; and in addition, by a number of important auxiliary fac tors such as hourly production floor space, tie-in with preceding and following operations.

The complete analysis of any cleaning problem must take into consideration all of the above fac tors.

Factors affecting the selection of the cleaning materials.

1. *Nature of the dirt:* As the term is commonly used, dirt may mean a great number of things such as: oil or grease, metal chips abrasive particles, smut, rust drawing compound, slushing com pound, carbon deposit, charred lu bricant or quenching oil, shop dirt flux, hardening salt, etc. To remove each of the above dirts requires a special chemical. It is futile to dream of any one "do-all" chemical that would completely remove all

"Chemically clean" has but one meaning. It means "absolutely clean.

dirts of either vegetables, animal or mineral origin.

2. *Abundance of the dirt:* The dirt may exist as film, or as a thick layer. The abundance or complexity of a dirt may lead to considering the use of a multi-stage cleaning treatment. Smooth surfaced simple parts can be cleaned much easier than hollow, drilled, seamed, engraved or embossed parts, for the latter pick up a larger dirt load and usually hold it more tenaciously.

3. *Adherence of the dirt:* Loose dirts call for a light duty cleaner. Adherent dirts call for heavy duty penetrating and suspending agents and often for vigorous agitation, or electrocleaning.

4. *Nature of the parts covered by the dirt:* Steel parts are not attacked by strong alkaline solutions. On the contrary, aluminum, brass, die cast parts, will need the use of carefully buffered or inhibited chemicals which have action on the dirt without attacking the metal of the parts. On assemblies the treatment required for the chemically most susceptible part, will govern for the whole.

5. *Degree of cleanliness required:* Depending upon the operation following the cleaning treatment, the parts may be required *physically*, or *chemically* clean. And "physically clean" can have different meanings. In one case it may mean remove chips, but leave an oil film; in another it may mean remove chips and oil. It may mean clean enough to handle or inspect, or it may mean so clean that wiping with a clean white cloth will show no smudge.

There is no variation in the meaning of chemically clean—it means absolutely clean.

Each case means a different cleaning treatment.

Turn to Page F-49

NOW!

Condition alloy steel at

Factors affecting the selection of the cleaning method.

1. *Design of the parts to be cleaned:* According to their design or shape some parts may be sprayed, others should be dipped.

2. *Size of the parts:* Small parts can be handled in batches, in baskets, and should be dipped. Large parts are generally individually handled and may be either sprayed or dipped, depending upon their design.

3. *Degree of frailty of the parts:* Fragile or highly finished machine parts should not be handled in bulk or tumbled.

Factors affecting the selection of the cleaning equipment.

1. *Production required:* This is an important factor which governs the size of the equipment and whether or not it should be conveyorized.

2. *Available floor space:* This is another deciding factor that may govern the entire design of the equipment whether it progressed horizontally or vertically—direct or in U-turn.

3. *Preceding and following operations to be tied in with the cleaning treatment:* Such auxiliary operations may include pickling, bonderizing, painting, baking, heat treating, etc.

4. *Amount of labor to operate:* For instance on a straightaway conveyor, one operator might be required for loading, and another for unloading. On a turn table or a U-turn conveyor one operator only, could both load and unload.

5. *Other factors:* Available heating means, necessity of having the parts finished dry or cold, plant safety and personnel hazards connected with use of solvents. Further, flexibility, versatility or adaptability to different types of work which may be run at different times, are also to be considered.

Glossary of Terms Used in Metal Cleaning and Finishing

ABRASIVE—Any substance used to rub away or wear away a surface. Applied generally to both bonded (wheels, bricks, files) and unbonded types. In blast cleaning, it means a loose material thrown against a surface with force for cleaning or carving purposes.

ACID—A chemical which gives hydrogen ions in water solution, and which neutralizes bases to form salts.

ACTIVE—Property of reacting chemically, i.e. a metallic surface upon which another metal can be electrodeposited.

ADDITION AGENT—Material added to a bath to improve quality of deposit or extend plating range.

ADHESION—Ability of a coat to adhere to the material to which it is applied.

ADSORPTION—A change of concentration at an interface. In an emulsion of oil in a soap solution, soap concentrates on the surface of the oil globules (the interface between oil and water).

AIRBLAST—Treating of material surfaces by subjecting them to a bombardment of hard, granulated particles called abrasives, projected at high velocity by compressed air.

AIR HOLE—Hole or defect in casting caused by gas trapped in the metal during solidification.

AIRLESS BLAST CLEANING—Application of abrasive to object to be cleaned by a force other than compressed air, usually by centrifugal force.

ALKALI—Broadly, a material

—Glossary of Terms—

which dissolved in water will give it an alkaline reaction—that is, a pH greater than 7. Sodium and potassium hydroxides are caustic alkalies.

ALLOY—Metallic material formed by mixing two or more chemical elements in significant amounts. Usually applied to metals to which chemical elements have been added to impart specific properties.

ALMAN GAGE—Used to measure intensity of peening.

AMPERE—A unit of electric current; a current necessary to plate 0.001118 gram of silver per second; the current which one volt will force through a resistance of one ohm.

AMPERE HOUR—One ampere of current flowing for one hour.

AMPHOTERIC—Having both acidic and basic properties. Zinc and aluminum hydroxides are amphoteric. With acids they form salts (as chlorides). With alkalies they form zincates and aluminates.

ANHYDROUS — Containing no water.

ANODE—Positive electrode. The electrode at which oxidation occurs.

AQUEOUS—Watery.

ARRESTOR, DUST—Equipment which separates dust from air.

ATOM—The unit particle of an element.

ATOMIC WEIGHT—Weight of an element on the atomic scale in which oxygen equals 16.00.

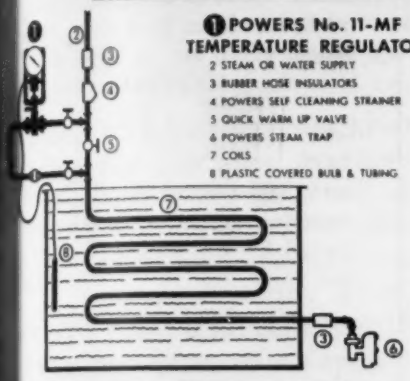
—B—

BALANCED BATH—Electroplating bath where the amount of metal supplied is about equal to the amount removed.

BARREL—In blast cleaning, denotes a type of equipment into which work is placed (usually in batches) for cleaning purposes. The modern barrel is an auto-

Turn to Page F-52

Cut Cost of Metal Finishing Processes
and Get Better Quality Products



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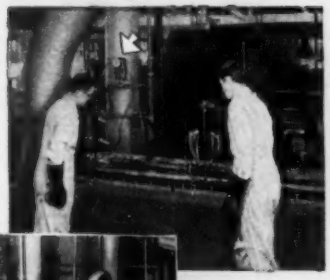

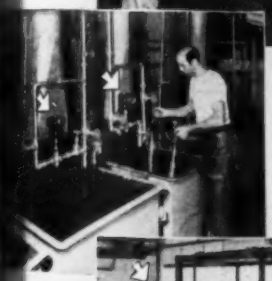

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(b69)

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matic cleaning machine which tumbles the work continuously. Term originated from practice of placing castings in a barrel-like device filled with sand or grit and churning to secure scouring action.

BASE—A substance which give hydroxide ions in solution and which neutralizes acids forming salts.

BASE BOX—Unit of tinplate measure. It corresponds to an area equivalent to 112 sheets of tinplate, each 14 x 20 in.; or 31,360 sq in.; or 217.78 sq ft.

BASE METAL — The principal metal in an alloy.

BASIS METAL — The metal on which an electroplate is deposited.

BATH — The electroplating solution.

BAUME SCALE—Scale of specific gravities of solutions.

BLAST CARVING—Application of abrasive force to metals, stone, wood, glass, etc., to carve a preconceived design on surface.

BLAST CLEANING—Removal of sand, scale, etc., from castings and heat-treated metals by the scouring action of abrasive projected by air, water or centrifugal force.

BRINELL HARDNESS — Testing scale to determine relative hardness of a metal or alloy by measuring diameter of an impression made by a ball of given diameter under a known load.

BRITISH THERMAL UNIT (B.T.U.)—Amount of heat required to raise 1 lb of water 1°F.

BUFFER — A solution which resists and compensates any change of its degree of acidity or alkalinity.

—C—

CABINET — Blast cleaning machine, usually of the type where work is placed in enclosure and

Turn to Page F-54

"Rough time yesterday. I was sick enough to go to bed if it hadn't been a holiday!"

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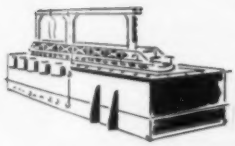

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WORLD'S LARGEST PLATING SUPPLIER

cleaned by operator who stands outside and manipulates the work or the abrasive stream through armholes in machine to secure results.

CAPILLARY — A tube of very small bore; any similar pore, crack or fissure of microscopic dimensions.

CASTING WASHER—Equipment designed to clean large castings by means of coarse sand suspended in water under high pressure. The sand scours the casting, while the blast forces knock down and carry away the usual large cores.

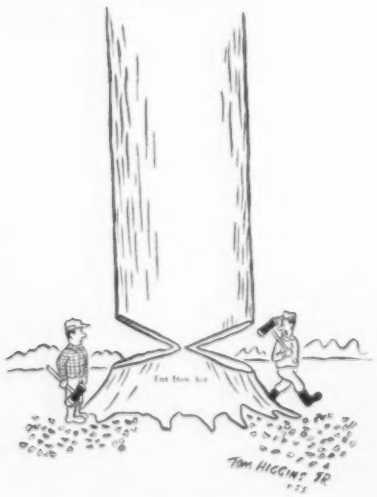
CATHODE — The negative electrode; the electrode at which reduction occurs.

CATHODE EFFICIENCY — The percentage of current required to produce the required plate at the cathode.

CENTRIGRADE — Temperature scale on which freezing point of water is 0° and boiling point 100°.

COLLOID — A phase subdivided and dispersed to such a degree that its surface forces become an important factor in determining its properties.

CONCENTRATION—The amount of substance (in weight, or in per cent) contained in a unit volume of solution.



"I don't work one second after quitting time."

CONDUCTANCE—The reciprocal of resistance; ability to allow electric current to pass.

CONDUCTIVITY — Ability of a bath to conduct current.

CONTAMINANTS—Impurities in a plating, cleaning or pickling solution.

COOLANT — A fluid vehicle for conveying away heat.

COULOMB — One ampere of current flowing for one second.

COUNTER-CURRENT — Term applied when two streams move in opposing directions.

CRYSTALLIZATION—Formation of crystals by the atoms assuming definite positions in a crystal lattice.

CURRENT DENSITY — Amount

Turn to Page F-56

NEW WYANDOTTE "FLOTE" for water-wash spray booths

Only 75¢ worth of "FLOTE" a day Saves up to $3,500 a year in maintenance costs!

New and different!

spray booth product, "FLOTE," eliminates sinking paint sludge, stops clogging and paint buildup!

Whatever organic finishes you use, no matter what type water-wash spray booth you employ — new "FLOTE" will increase operating efficiency and cut maintenance costs!

Think of it! New "FLOTE" added to your water system floats all types of sludge—even heavy primers—and *keeps them afloat* for easy skimming. In a spray booth like the one above, as little as 75¢ worth of "FLOTE" a day can save you up to $3,500 a year in maintenance costs!

"FLOTE" away your paint booth problems. For full information on this remarkable, new and different Wyandotte product, mail coupon today!

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CLEANING THE WORLD

Wyandotte Chemicals Corporation
Wyandotte, Michigan

Send me further data on "FLOTE" ☐
Have a representative call ☐

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

—Glossary of Terms—

Continued

of current per unit of area; usually expressed in amp per sq ft (a.s.f.).

CUTWIRE SHOT—Abrasive material made by cutting hard drawn steel wire into small pieces.

—D—

DECOMPOSITION POTENTIAL—The minimum potential required to start a reaction at an electrode.

DECORATIVE CARVING—Use of abrasive force to carve a design on a surface of metal, wood, glass, etc.

DEFLOCCULATE — To break up and put in fine dispersion; to put in a colloidal condition.

DESCALING — Scale removal by salt, hydrostatic pressure or high frequency.

DISPERSION — A very fine suspension, or a colloidal solution.

DRAG-IN — Impurities introduced into a bath from prior treatments.

DRAG-OUT—Solution lost from a bath on work carried out of it.

—E—

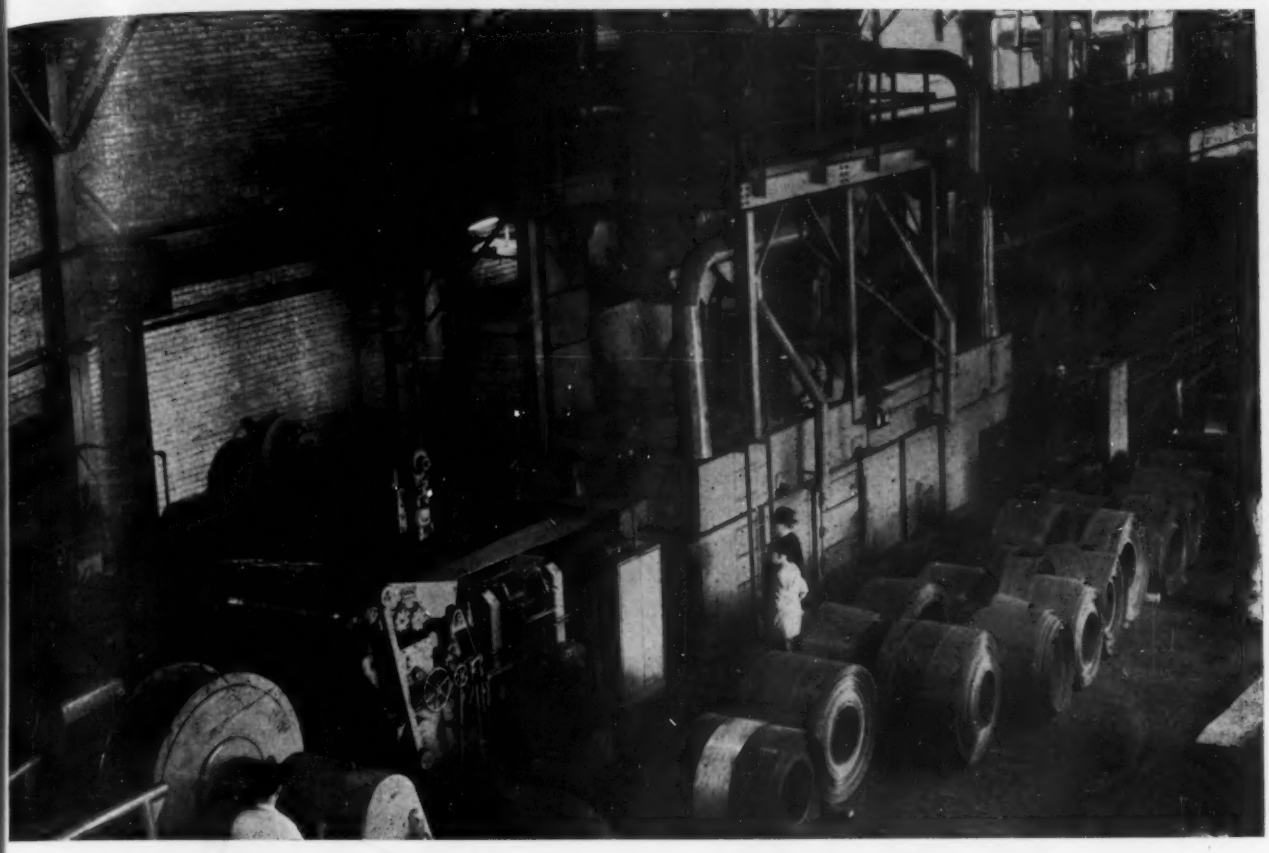
ELECTROCHEMICAL SERIES—An electromotive series.

ELECTROGALVANIZING — Deposition of zinc by electricity (as

Turn to Page F-58

"You may have graduated from the school of experience but they're giving a new course now!"

pioneering developments keep **WHEELABRATOR®** *first in blast cleaning*



Blasting Stainless Steel Descaling Costs

Allegheny Ludlum Saves Time, Money and Space with Wheelabrator Descaling

The cost of descaling hot-rolled steel strip and sheet has been drastically cut by mechanical descaling with airless Wheelabrator blast cleaning. At the West Leechburg plant of Allegheny Ludlum Steel Corp., stainless steel strip is descaled without scale breaking. It takes only five men to operate the Wheelabrator descaling line compared to 24 men for the batch pickling operation which it replaced. The Wheelabrator requires only 6,000 sq. ft. of floor space compared to about 10,500 sq. ft. for pickling. The loss of virgin metal has been virtually eliminated and the scale removed is in an easily recoverable condition. Reduction of acid consumption has simplified their acid disposal problem.

Steel is descaled through the controlled impact of Wheelabrator Steel Shot hurled by centrifugal force upon the steel surface to be cleaned. The constant, uniform flow of steel shot from the Wheelabrator units combined with the even, steady movement of the steel through the blast makes this mechanical cleaning method the most efficient descaling process yet devised.

Wheelabrator mechanical cleaning has been profitably applied to etching mill rolls and has effected unusual economies in cleaning strip, sheet, bar stock and skelp. Send now for complete details. Send for Bulletin 894 "How to Descale Steel Strip Mechanically" and Bulletin 914 "How to Descale Steel Sheet at High Speed and Low Cost."

Bulletin 894 tells how to descale steel strip at high speeds and low cost. Send for your copy today.

American
WHEELABRATOR & EQUIPMENT CORP.
510 S. Byrkit St., Mishawaka, Ind.

Wheelabrator® AIRLESS BLAST CLEANING

Glossary of Terms
Continued

opposed to hot dip galvanizing).

ELECTROLESS NICKEL PLATING — Immersion plating of nickel.

ELECTROLYSIS — The electrochemical reactions resulting from the passage of direct current through an electrolyte.

ELECTROLYTE—A solution of a salt, an acid or a base. Solutions of these conduct electricity in varying degree. Other solutions do not.

ELECTROLYTIC CLEANING — Cleaning by, or aided by, electrolysis.

ELECTROLYTIC PICKLING — Electrochemical removal of surface oxides.

ELECTROMOTIVE FORCE (e.m.f.)—Electric potential; voltage.

ELECTROPOSITIVE — A substance which passes to the cathode during electrolysis.

EMULSION — A dispersion of minute drops of one liquid in another.

ETCH—Chemical removal of part of the surface of a metal, producing a rough surface.

—F—

FAHRENHEIT — Temperature scale in which 32° denotes the freezing point and 212° the boiling point of water.

FARADAY—The amount of electricity necessary to plate out one atomic weight of a monovalent metal (as Ag +), ½ atomic wgt. of a divalent metal (as Cu ++), etc. 1 F = 96500 coulombs.

FINES—Sand grain sizes substantially smaller than the usual

grain size of molding sand, usually present in spent abrasive after blast cleaning because of disintegration of sand grains under abrasive force.

GAS PLATING—Plating in an enclosed and controlled atmosphere by means of heat-decomposable metal vapor compounds.

GRIT, ABRASIVE — An abrasive material consisting of crushed ferrous or synthetic material, which presents a series of fine cutting surfaces against the work to be cleaned.

—H-O—

HYDROLYSIS—Chemical reaction between water and a salt dissolved in it, whereby the latter partially reverts to the acid and base from which the salt was formed.

HYDROXIDE—A hydrated metallic oxide; a base; a compound which will give hydroxyl ions (OH^-) in solution.

IMMERSION PLATING—Plating by chemical reduction of a metal from a solution of its salts rather than by electrolytic means.

INHIBITOR—Material which will prevent a chemical reaction from proceeding; material whose presence will prevent corrosion of metal.

INTERFACIAL TENSION — The physical force which keeps oil and water from mixing and which determines the nature of the boundary between two liquids when brought together.

ION—An atom or molecule bearing an electric charge, in solution. These ions are the conductors of electricity during electrolysis.

METAL REPLACEMENT — Deposition of a metal from a solution of its ions on a more anodic metal, accompanied by solution of the latter metal.

METALLIZING—Spraying a surface with metal.

MINERAL ACIDS — Inorganic acids, commercial quality, as muriatic or sulphuric acids.

NOBLE METAL — One that de-

Turn Page

"It took you a long time to get experience —why don't you use it?"

—Glossary of Terms—

posits easily from a plating bath. At low current density, one that will deposit exclusively in competition with another metal.

OHM — Unit of electrical resistance.

OVERVOLTAGE — For the same reaction, the difference between the potential at an electrode at which a reaction is actively taking place and another electrode at equilibrium. In plating, the minimum voltage at which reaction at an electrode just begins.

OXIDATION — Loss of electrons by a constitutent of a chemical reaction.

— P-R —

PASSIVE — That property of a surface which inhibits chemical reaction. Electroplating is impractical on passive surfaces.

pH—Symbol used to indicate degree of acidity or alkalinity. On pH scale going from 0 to 7 we have degreasing acidity. pH 7 is neutral. From pH 7 we have increasing alkalinity up to 14.

PHASE—One of the constituents of a non-homogeneous system. In an emulsion of oil in water, we have two phases. The water (or aqueous phase) is the continuous phase. The oil is the discontinuous phase.

PICKLING — Chemical acid removal of surface oxides.

Turn to Page F-63

"Hasse, I don't know whether you're a stretchout or a cutback!"

Glossary of Terms

PLATING RANGE—The range of current over which a satisfactory plate can be deposited.

POLARIZATION — A reverse potential in electroplating tending to resist the flow of current.

RECOALESCENCE—The union of emulsion globules, resulting in a "breaking" or separating of the emulsion.

REDUCTION — The opposite of oxidation.

—S—

SALT—A chemical compound resulting from the neutralization of an acid with a base. "Acid salts" are incompletely neutralized acids. "Basic salts" are incompletely neutralized bases.

SAND BLAST—Method of projecting abrasive sand against a material surface to clean, cut, polish or carve. Loosely applied today to the blast cleaning process, even where metallic abrasives are used.

SEPARATOR, ABRASIVE — A device used in modern blast cleaning equipment to clean the spent abrasive of blasting debris and return the good abrasive to the system for re-use. Two phases of abrasive cleaning are employed: (1) a scalping wheel which removes particles larger than the abrasive size and (2) an air wash which removes small particles.

SHOT — Type of metal abrasive which consists of small spherical pellets. Cleans without the scouring effect of grit.

Turn to Page F-65

Two Sure Ways to Protect METAL PRODUCTS, PARTS AND PLANT EQUIPMENT *Against Corrosion, Abrasion*

"RUBBERHIDE" PROCESSED LININGS

Corrosion or abrasion cannot get a foothold after "RUBBERHIDE" Linings have been processed to the exterior or interior surfaces of metal objects, regardless of their size, shape or service requirements. Compounded from rubber or neoprene to provide proper resistance to the specific corrosive agents involved, or to combat abrasive wear, these modern Linings invariably repay many times their cost through extended life of the products, parts or equipment to which they have been applied.

"RUBBERHIDE" Linings are processed to objects shipped to any of our three Linings Plants in Trenton, Chicago and Houston; or, when the equipment is too large for economical shipment to and from these points, or is permanently installed, experienced field crews do the processing "on location".

"ALLGOOD" MAINTENANCE COATINGS

The ideal way to protect the plant and its equipment from the effects of weather, corrosion and other destructive agents. With no greater time or effort than required to apply ordinary paint, "Allgood" Maintenance Coatings can be brushed- or sprayed-on to give a tough, durable covering that will pay for itself over and over again through savings in maintenance and replacement costs. Equally effective on metal, wood and concrete. Made in several different formulas to meet specific conditions. Available in quart and gallon cans.

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The Iron Age

SALUTES

Norman B. Obbard

A top engineer-administrator, his drive and direct approach have helped achieve many tough goals.

WHEN Norm Obbard became president of U. S. Steel Corp.'s American Bridge Div., he insisted on continuing a practice of long standing—dialing his own telephone calls.

His friends say this might seem like a small thing hardly worth mentioning, but the significance to them is that it typifies Obbard's direct approach, his refusal to be hemmed in by convention and window-dressing.

That's the way it's been with this ruddy-faced builder of bridges, skyscrapers, and steel mill furnaces since he came to the U. S. from England and took a job as a draftsman. He joined American Bridge in 1926 as an engineer in the Tower Department.

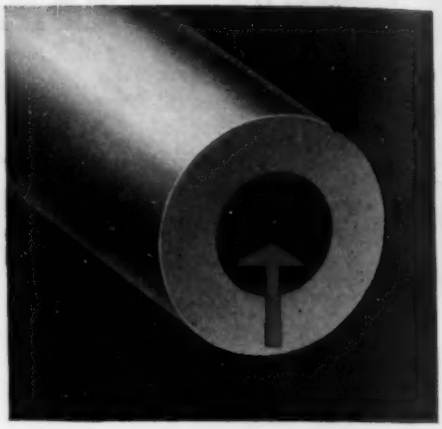
Norm is as much a salesman as an engineer, and a top-flight administrator to boot.

During World War II he was boss of his company's shipyard at Ambridge, Pa., which delivered 143 seagoing vessels to the Navy in two years. From 1946 to his election as president he was vice-president and general contracting manager, and handled contracts on such jobs as United Nations headquarters, the Delaware Memorial Bridge, and New York Thruway bridges.

For relaxation, Norm likes nothing better than refinishing antique furniture or making scale models of electric melting furnaces. A current project: converting the lamps in his driveway into gas burners, controlled by an electric switch.

Norm lives with his wife, Doris, and their three sons—John, Peter, and James—in Sewickley, Pa., a suburb of Pittsburgh.

a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW TOOL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

The Iron Age

INTRODUCES

Thomas L. **Fawick,** chairman of the board, elected president, **Federal Fawick Corp.,** Cleveland.

Lee **Lewis,** elected vice-president and director, MoPar Motor Parts Corp., a division of **Chrysler Corp.,** Detroit; and **S. J. Wall,** appointed director of sales for the Parts Div.

C. C. **Fuller,** elected vice-president-treasurer, **American Blower Corp.,** Detroit; and **Arthur V. Lafave,** appointed assistant treasurer and assistant secretary.

Richard **D. Baker,** vice-president, Pittsburgh office, elected a director, **Russell, Burdsall & Ward Bolt and Nut Co.,** Port Chester, N. Y.

Francis **M. Wistert,** becomes director of industrial relations, **The Electric Auto-Lite Co.,** Toledo; George **H. Souther,** named manager of legal and patent departments; and **F. C. Huebner,** appointed supervisor of work standards.

Norman **B. Pilling,** appointed assistant to the vice-president-manager, Development and Research Div., **The International Nickel Co., Inc.,** New York.

J. C. **Miller** and **G. H. Walgren,** elected to board of directors, **Hanson-Van Winkle-Munning Co.,** Matawan, N. J.

Clinton **R. Milstead,** made assistant director of public relations, Southeast district, **U. S. Steel Corp.;** and **William F. Higginbotham, Jr.,** becomes Southeastern field representative.

Robert J. Sutton, appointed treasurer and secretary, Atkins Saw Div., **Borg-Warner Corp.,** Indianapolis.

William C. Heilbrun, appointed procurement director, Aircraft Div., **Kaiser Metal Products, Inc.,** Bristol, Pa.

W. R. Crooks, becomes chief engineer, Development Div., **The Cooper-Bessemer Corp.,** Mt. Vernon, Ohio.

Jules F. Boand, Jr., named Pacific Coast manager of sales and technical service, **Titanium Metals Corp. of America,** effective Aug. 1.

John G. Watson, becomes district manager, **Baldwin-Lima-Hamilton Corp.,** Construction Equipment Div., Lima, Ohio.

Kenneth V. Lutz, appointed general sales manager, **All-State Welding Alloys Co., Inc.,** White Plains, N. Y.

Roland S. Withers, appointed general merchandising manager, AC Spark Plug Div., **General Motors Corp.,** Flint, Mich.

D. E. Knight, joins General Sales Dept. Staff, Haynes Stellite Co., a division of **Union Carbide and Carbon Corp.,** New York.

Jack H. Walters, named gas products manager, Meter and Valve Div., **Rockwell Mfg. Co.,** Pittsburgh, and Thomas I. Stacy, becomes district manager.

Joseph Costello, promoted to electrical turn foreman, Monessen, Pa. Works, **Pittsburgh Steel Co.**

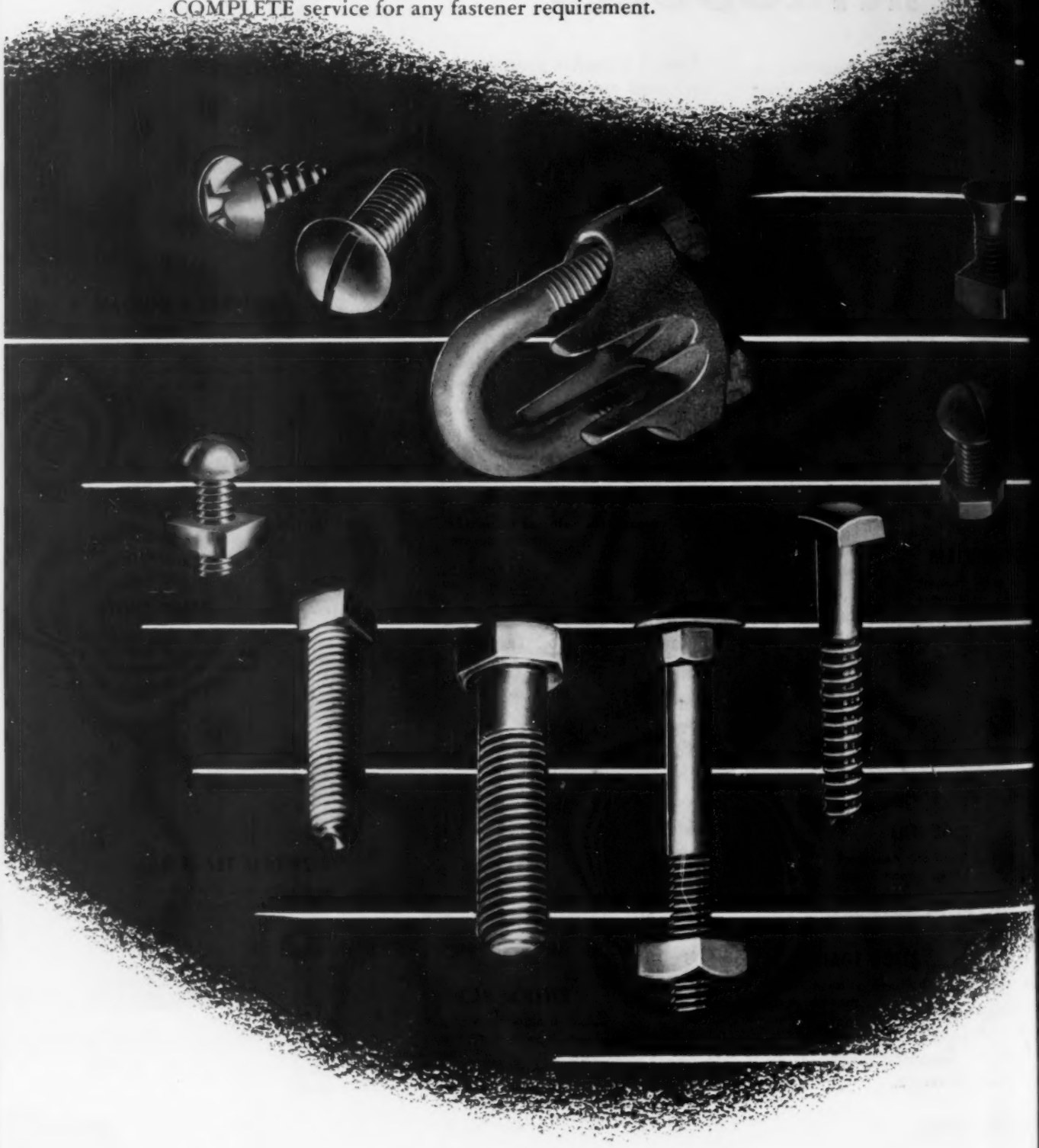
G. W. TRICHEL, elected executive vice-president and general manager, Amplex Div., Chrysler Corp., Detroit.

ALBERT C. WEDEMEYER, elected vice-president and director, Rheem Mfg. Co., New York office.

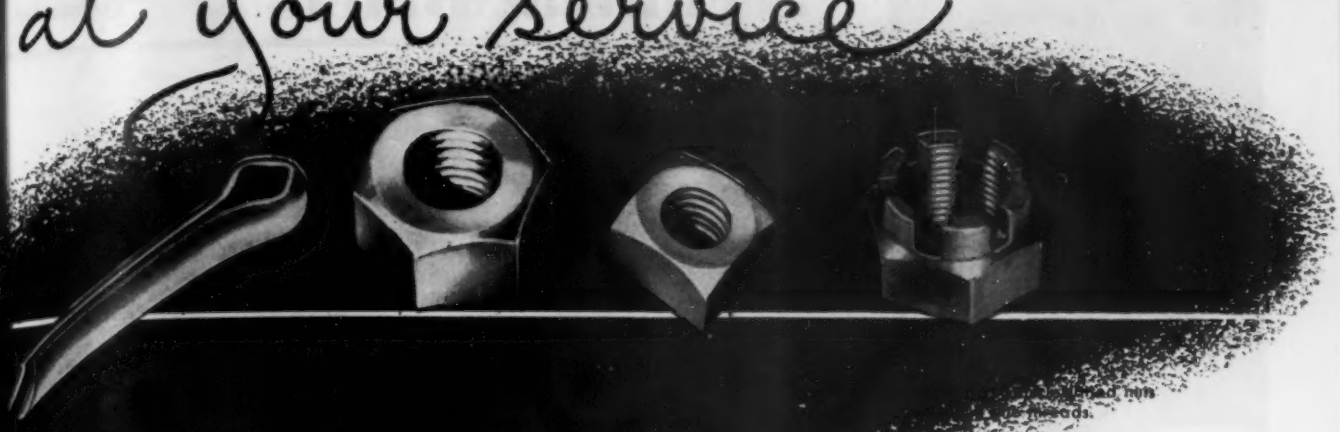
VICTOR LADETTO, appointed vice-president and sales manager, Continental Screw Co., New Bedford, Mass.

LAMSON IS EVERYWHER

● Many things contribute to the worth of a product . . . the research, the raw material, the manufacturers' machines, skill and experience, the business ethics and many more. Equally as important, however, is the availability of the product. The best product in the world would want for customers, if it were not easy to order and easy to get. Here again, Lamson & Sessions is a leader in the fastener industry. Lamson manufactures a *COMPLETE* line of bolts, nuts, screws, cotters, rivets and threaded products. In addition to the COMPLETE LINE, Lamson is available *EVERYWHERE* . . . five plants, 17 sales offices and distributors in over 200 cities assure you of QUICK, COMPLETE service for any fastener requirement.



at your service



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SCREWS COTTERS

RIVETS AND

SPECIALS

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Grinding:

Central cooling boosts efficiency of grinders.

Central systems for supplying coolant to all of a plant's grinding machines are being used to increase efficiency of grinding operations and product quality. Downtime is cut through elimination of sludge cleaning. Coolant waste is eliminated and the constant supply of clean coolant promotes better part finish. Dimensions may be held more easily because of uniform coolant temperature.

At the Warner & Swasey Parts plant, New Philadelphia, Ohio, all of the grinding machines are served by pressure piping from two 2100-gal filtering tanks. Spent coolant containing work chips and abrasive particles is discharged from the machines into a covered floor channel through which it flows back to filtering tanks by gravity.

Filter Paper Cleans Coolant

Spent coolant drops into either or both of the filtering tanks. Continuous rolls of 48-in. wide filtering paper strain contaminating particles from the fluid. Clear coolant, withdrawn from the bottom of the tanks, is pumped back to the machines at a maximum relief valve setting of 25 psi.

Three 450 gpm vaned impeller-type pumps may be operated in conjunction with one or both of the filtering tanks in accordance with the number of machines operating. Twenty-eight external and rotary surface grinders are working in the system, which has an ultimate capacity of 40 machines.

Trough carries coolant . . .

Cuts Downtime

Pumping rates and paper feed are regulated by level control switches in the tanks. Used paper feeds into steel bins at the rear of the filter room, where an opening permits periodical removal for disposal of waste material.

This system offers a number of advantages. It eliminates grinder down-time and nonproductive labor required for the frequent sump cleaning of individual machines. A constant supply of clear coolant of controlled mixture is assured. Coolant waste is virtually eliminated.

The system makes it possible to maintain a uniform coolant temperature, simplifing parts accuracy on the machines. Based on the saving in the time of two men needed for sump cleaning, plus the idle time of machines, the installation is expected to pay for itself in two years.

Paper filters it clean . . .

IF YOU WANT MORE DATA

You may secure additional information on any item briefed in this section by using the reply card on page 151. Just indicate the page on which it appears. Be sure to note exactly the information wanted.

—Technical Briefs—

Flame Plating:

Paint sprayer part life increased by flame plating.

Coating the vanes of a paint atomizer with tungsten carbide by flame plating has increased its life threefold, one company reports.

Spins At 20,000 Rpm

The atomizer, used in an unusual paint spraying machine, spins at 20,000 rpm. At these speeds abrasive particles in the paint and the paint itself wear away the surfaces of the vanes in about 200 hours. The tungsten carbide flame plated surface resists this abrasive action, reducing downtime and replacement costs.

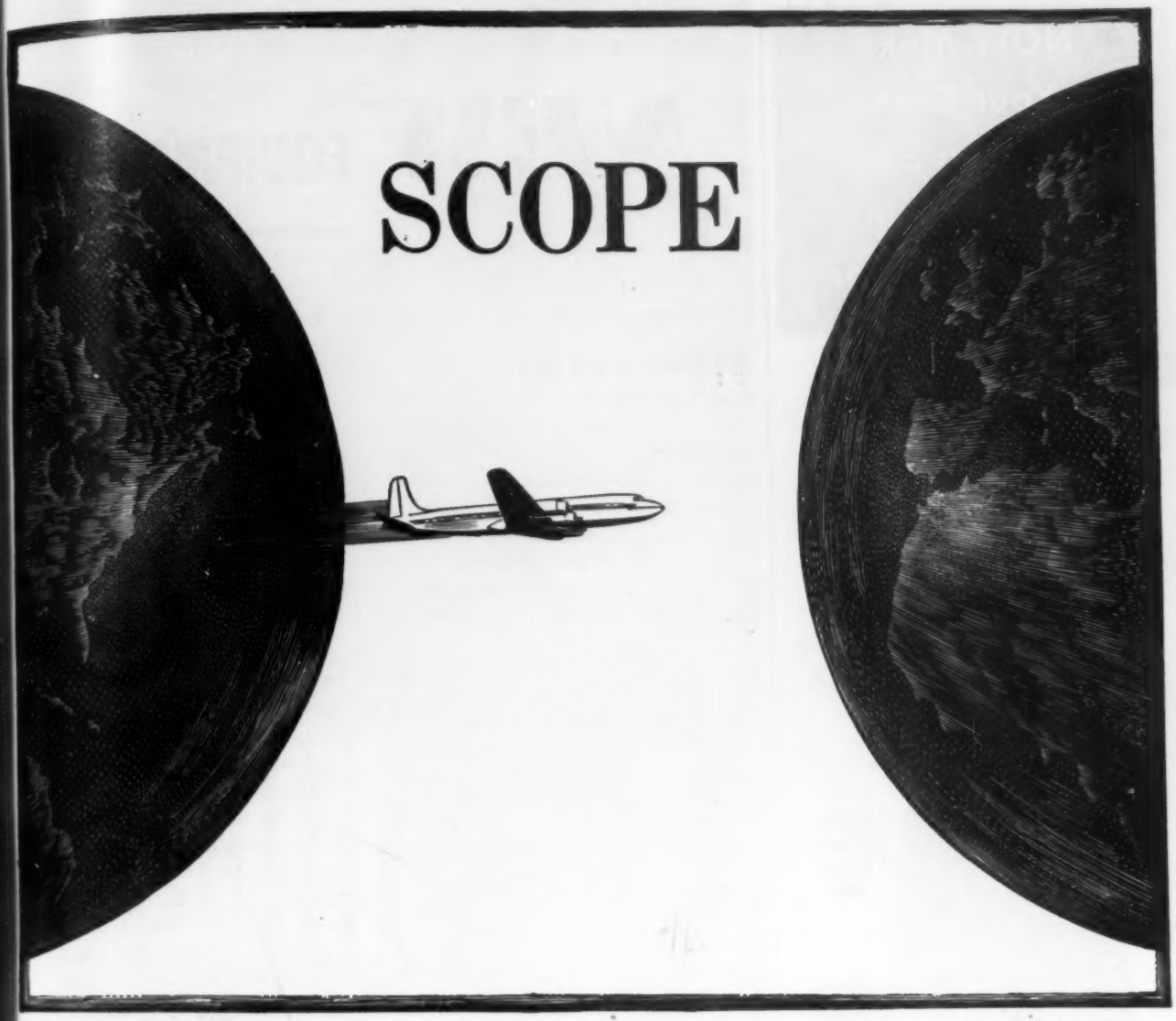
Flame plating, as developed by Linde Air Products Co., a Div. of Union Carbide and Carbon Corp., deposits a thin coating of tungsten carbide on the surfaces of parts and many tools where extra resistance to wear is required.

Imparts Wear Resistance

Parts made of many common metals can be flame plated to produce unusual combinations of metallurgical properties such as wear-resistance with light-weight or toughness.

Because temperature of the part being plated does not exceed 400°F, physical properties of the base metal are not altered. The tungsten carbide coating may be left in as-coated condition or ground to a mirror-like smoothness. Parts now being flame plated with success include plug and ring gages, core rods, spindles, pusher pads, turbine shaft retainer seals, gripping dogs, and wire straightening rollers.

Spins at 20,000 rpm . . .



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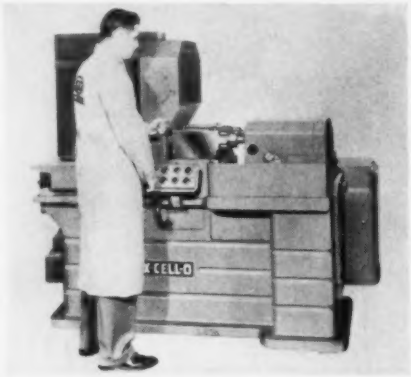
NEW EQUIPMENT

New and improved production ideas, equipment, services and methods described here offer production economies . . . for more data use the free postcard on page 151 or 152.

Requires no levers

Cam followers impart the rise and fall of cams directly to the machine table and cross slide of a new precision boring machine. These machines, used for precision finishing work such as contouring, boring, turning, facing and grooving, have no levers. It accommodates parts that can be rotated on one or more



spindles. Forms that are reproduced to close tolerances can be inspected by checking one dimension. Accuracy of other dimensions are determined by cams. Cams are hardened and ground, and cam followers are tipped with tungsten carbide. *Ex-Cell-O Corp.*

For more data circle No. 15 on postcard, p. 151.

Phosphate coatings

Ty-Bond, a new zinc phosphate coating, forms a smooth, dense, and hard coating to the basis metals. Exceptionally adherent and durable, Ty-Bond coatings cannot be removed, cracked, or damaged in any way by severe bending or flexing. They integrate themselves with the metals to form a denser, harder coating for better more complete rustproofing. Several different types provide a wide range of coating weights. *Cowles Chemical Co.*

For more data circle No. 16 on postcard, p. 151.

Cuts oil costs

Ferrous metal particles and entrained abrasive materials are effectively removed from soluble oil coolants and mineral cutting oils with the new Barnesdril combination magnetic and fabric tank type filter. In the compact Kleenall unit, fluids are first exposed to the intense magnetic field of the separator drum by passing through a flow channel surrounding the drum.

Particles are rotated from the flow channel to a point where they are scraped off and removed from the system. The coolant then flows through the fabric filter. A mechanism automatically moves the fabric forward as needed. All waste material is deposited in a sludge pan for easy disposal. Working parts are enclosed for positive lubrication. *Barnes Drill Co.*

For more data circle No. 17 on postcard, p. 151.

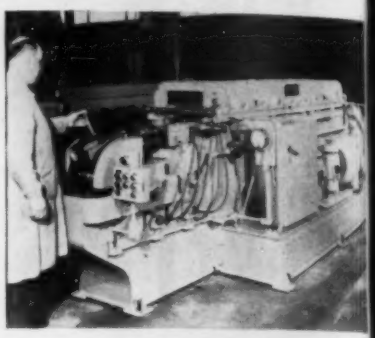
Turn Page

—New Equipment—

Continued

High output broaching

A new horizontal type continuous broaching machine, through improved design and application of automation principles, has substantially raised the output of connecting rods at one plant. At top speed, the machine can broach 1800 connecting rods per hour. The part is made from a steel forging and

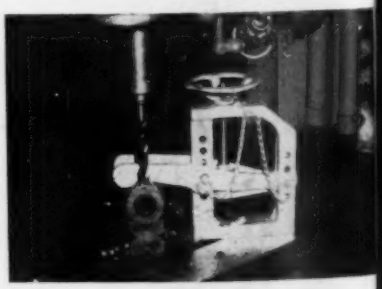


about ⅛ in. of metal is removed. Built with a stroke of 120 in., the machine is powered by a 30-hp motor. The machine is designed with a series of individual self-operating, self-locating and self clamping fixtures so arranged that the operator merely has to insert the parts into the work nests. *The Lapointe Machine Tool Co.*

For more data circle No. 18 on postcard, p. 151.

Safety clamp

New safety adjustable clamp saves in setup time, affords flexibility with greater speed and consequent reduction of cost. The clamp is equally useful for precision or production work; gives 8000 psi equal-



ized pressure with compound leverage. It clamps to a T-slot table, the adjustable pins are set, the work inserted, the leverage wheel turned — and work can begin. *Safety - Adjustable - Hold - Down Clamp Co.*

For more data circle No. 19 on postcard, p. 151.

THE IRON AGE SUMMARY...

- Summer steel slump not nearly so bad as many feared
- Auto, warehouse demand counted on for fall pickup
- Mill prices are stable but warehouses are up $4.50

Production . . . The summer slump in steel production is not proving as bad as some in the industry feared it would be. Although some experienced observers thought the ingot rate would drop to 60 pct of capacity or less during July or August, that now seems highly unlikely.

Steelmaking operations this week are scheduled at 64.5 pct of rated capacity, 1 point lower than last week's revised rate. Except for the week of the Fourth of July holiday, this could turn out to be the low for the year.

The steel ingot production index for this week is estimated at 95.7, only a few points below the average for 1947-49.

New Orders . . . Plant-wide vacations of steel consumers are exerting more impact on the market than most experienced steel men can remember. More than any other factor, this is holding a damper on new orders. Shipment is also being delayed on some orders already on the books.

Demand . . . Prospect of a September upturn in steel business is brighter than ever this week. Producers are cheered by reports that the long down trend of warehouse business has been reversed. Despite an expected dip resulting from July vacations, steel mills can expect more orders from warehouses.

An early start on new car models is expected to bolster steel demand from the auto industry by September.

Add strengthening seasonal influences in other steel consuming industries, and it is not hard to figure why steelmakers are counting strongly on a pickup in September.

Outlook . . . Despite some gloomy predictions, 1954 will turn out to be a relatively good year. Not as good as last year, but better than most. While production in the first half was 24 pct below last year's record pace, it is close to any other first half on record. Financial reports coming out this week will show those who like to watch percent of capacity and break-even points that the industry can show fair earnings while operating at about 70 pct of capacity. The second half of '54 should be at least as good as the first half.

Prices . . . Steel mill prices are stable following the recent increase. However a survey by THE IRON AGE indicates that steel producers are absorbing freight charges at an average rate of about 75¢ to $1 a ton. If maintained through the year this rate of freight absorption would amount to about $70 million.

Warehouse prices have been raised an average of about $4.50 a ton.

Steel Output, Operating Rates

	This Week†	Last Week	Month Ago	Year Ago
Production				
(Net tons, 000 omitted)	1,538	1,557	1,568	2,087
Ingot Index				
(1947—49 = 100)	95.7	96.9	97.6	129.9
Operating Rates				
Chicago	65.0	68.5	79.0	90.5
Pittsburgh	62.0	61.0*	69.0	96.0
Philadelphia	56.0	56.0	57.0	98.0
Valley	59.0	60.0	64.0	97.0
West	81.5	77.0*	77.0	100.0
Detroit	60.0	79.0	36.0	99.0
Buffalo	56.0	59.0	67.5	106.5
Cleveland	63.0	67.0	63.0	98.5
Birmingham	76.0	75.0	76.0	98.5
S. Ohio River	68.0	68.0	82.5	92.0
Wheeling	82.0	88.0*	95.0	100.0
St. Louis	47.5	54.0	65.5	93.0
East	32.0	32.0	50.0	101.5
Aggregate	64.5	65.5	67.5	93.0

* Revised. † Tentative

Prices At A Glance

(cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
Composite prices				
Finished Steel, base	4.801	4.801	4.634	4.634
Pig Iron (gross ton)	$56.59	$56.59	$56.59	$56.76
Scrap, No. 1 hvy (gross ton)	$27.33	$26.83	$26.92	$44.92
Nonferrous				
Aluminum, ingot	21.50	21.50	21.50	21.50
Copper, electrolytic	30.00	30.00	30.00	29.875
Lead, St. Louis	13.80	13.80	13.80	13.55
Magnesium, ingot	27.75	27.75	27.75	27.00
Nickel, electrolytic	63.08	63.08	63.08	63.08
Tin Straits, N. Y.	97.00	96.625	96.50	78.25
Zinc, E. St. Louis	11.00	11.00	11.00	11.00

500,000 castings without a reject by using RESINOX 1128 bonded shells

Gray iron is poured into 34 molds from one ladle as they pass on a conveyer belt. Permeable sand-Resinox 1128 shell molds permit gases to escape, eliminate many metallurgical defects such as blowholes, porosity and cold shuts.

That's the record of Midwest Foundry Co., Coldwater, Michigan

Half a million items, cast to a tolerance of .010" without a single reject . . . labor costs reduced more than half . . . 12 pounds of finished product for every 15 pounds of metal poured . . . elimination of machining on intricate designs . . . 20% lighter molds, on the average . . . up to 4 times more production per man hour—these shell molding advantages reported by Midwest Foundry Company are typical of those experienced by foundries throughout the country.

"We are producing a cylinder liner with thin vertical walls demanding very close tolerances, by shell molding with Monsanto Resinox 1128," reports Mr. Albert H. Doerr, Chief Engineer. "The high flow characteristics of Resinox 1128 combined with the integral core features of shell molding give us high quality finish, clean stripping and closer dimensional tolerances than with any other combination . . . and we are getting these results with an exceptionally low 5% resin-to-sand ratio."

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SERVING INDUSTRY...WHICH SERVES MANKIND

Producers Still Expect Pickup

Strength continues in galvanized sheets, oil country goods, structurals . . . But most other products still aren't snapping out of their drawn-out slump.

Steel producers are taking heart from a report by Walter S. Doxsey, president of the American Steel Warehouse Assn., to the effect that shipments from warehouses have leveled off, ending a month-to-month decline that began in the summer of last year (see p. 53).

Steel warehouse shipments improved during May and June, compared with declines during the same months of 1953. Shipments from mills to warehouses increased during the March-May period, reversing a trend begun in March 1953.

While there is little else to cheer about at the moment, steel sales executives are convinced the worst is about over. They're still betting on that long-predicted pickup beginning in September. Some mills look for an improvement at the melt shop level in last 2 weeks of August, particularly if the automobile producers carry through with proposed plans to begin producing new models earlier than usual this year. Strikes at Chrysler plants last week were threatening to delay that company's plans to be off first in the new model derby.

On a product basis the picture shows no change from last week. Strength continues in galvanized sheets, oil country goods, structurals, and, with some producers, light plates. Other products give no sign of snapping out of their slump.

SHEETS AND STRIP . . . Fair-haired boy in the flat-rolled end of the business is galvanized sheets. Demand continues strong; even the warehouses are receiving sizable orders in the **Chicago** area. The boom is due mostly to government grain loan programs. Tinplate business is dropping. Producers are worried about adverse weather conditions that are endangering corn and other crops. Crop failures mean less tinplate consumption for canning. Demand for cold-rolled strip picked up slightly in **Chicago**, where buyers for appliance producers are more active; one mill is offering 6-week delivery on cold-rolled, 3-4 weeks on hot rolled. The stainless sheet and strip market continues in the doldrums; **Cleveland** mills note a slight falling off in recent weeks but look hopefully to **Detroit** for a pickup in late summer or early fall.

Purchasing Agent's Checklist

BARS . . . With no releases from automobile customers, **Pittsburgh** bar producers find business is still slow. There has been a slight improvement in shipments to warehouses; government buying is at a lower level so there is no help from that direction. In **Cleveland**, producers are hopeful that a pickup will materialize in August, but that will depend on what the automobile companies do. **Chicago** finds nothing to be hopeful about in the near future. Increased highway construction is helping the **West Coast** market, but in the Los Angeles area shipments were reduced due to strikes by several construction union groups.

STRUCTURALS AND PLATE . . . Structurals are considered a strong product in the **Chicago** area, although deliveries are short and some space is available on the order books. **Chicago** also reports that plate is on a 2-3 week delivery basis with both local and out-of-area mills. Similar reports from other producing centers. The week-to-week change in these products has been very slight as construction activity continues high, and freight car building and shipbuilding remain depressed.

WIRE . . . In **Pittsburgh** manufacturers wire is showing a slight upward trend after a slump of several weeks; merchant trade demand is off but not so much as at this time last year; fall buying of merchant wire should start soon. Demand for construction wire is strong. One **Pittsburgh** producer reports that June set an all-time production record, climaxing a month-to-month increase starting in January. In **Chicago**, wire demand continues good due chiefly to merchant product activity; weld rod stock has picked up slightly. **Cleveland** finds the market off considerably in the last month after a period of optimistic reports.

TUBULAR . . . No change in oil country demand—still good. **Pittsburgh** reports continued slump in demand for mechanical tubing. **Chicago** is more optimistic, reporting a slight fall in mechanical tubing deliveries but enough of a market to be considered good.

WAREHOUSES . . . A survey in the **Los Angeles** area indicates that warehouse customers refused to get high blood pressure over the recent price increases. They're taking it in stride with little complaint. In the **East**, the warehouses have taken advantage of the change in price structure to correct some inequities that grew up before the steel wage settlement. A rundown on the market from **Chicago**: alloy and cold finished bars, sheets, and plate are slow movers, with the latter plagued by sharp price competition; warehouse buying has revived slightly in cold-rolled sheets but continues generally slow. **Cleveland** houses have moved their prices up after momentary hesitation in fear that competition would force prices down again; in fact, some Cleveland distributors are keeping their fingers crossed even now.

Major Markets in Midsummer Lull

Metals mainly steady, waiting new developments . . . This week should bring aluminum wage settlement, price hike . . . Alloy prices up . . . Tin price on upturn—By *R. L. Hatschek.*

"Watchful waiting" was a pretty good description of major nonferrous markets early this week. Prices for some grades of secondary aluminum went up ¼¢ to ½¢, reflecting recent hikes in the cost of aluminum scrap, but generally the light metal trade was quiet, awaiting end of wage negotiations sometime this week. It's generally agreed aluminum workers will win some sort of wage increase, and that prices for virgin metal will rise correspondingly.

Lead and zinc producers were reasonably chipper. Lead demand was on the increase, with August orders ranging from moderate to good. Zinc producers felt that July would add up to a good month, thanks in large part to General Services Administration buying for the national stockpile. Sellers in both metals are anxiously waiting White House action on tariffs.

Tin continued to live up to its volatile market reputation. Price declines following the Indo-China settlement were well on the way to being overcome at press time. The recovery seemed to be international, for Singapore and London prices last week went up £6.

LEAD, ZINC . . . President Eisenhower last week sidestepped an immediate answer on the question of hiking lead and zinc import duties. The Tariff Commission had recommended a 50-pct boost in rates effective at the beginning of 1955. It was generally believed in the trade that the President had to take definite action within 60 days of the report, making July 20 the deadline.

But the President postponed action, probably for another 60-day period.

There is divided feeling in the trade as to why the Administration chose to postpone settlement of this issue. Some feel the President is hoping for an improvement in the market which would eliminate the need for bailing out the lead-zinc industry at this time.

Seasonal factors are currently boosting the strength of both. Battery manufacturers will buy more lead during August. Galvanizing and the brass industry will require more zinc next month.

Others in the industry believe the government plans other action to strengthen the positions of lead and zinc. Subsidies might be the way. But more likely is a further increase in stockpiling. Request for an additional $380 million in stockpiling funds is still grinding through the congressional mill. And perhaps the President is awaiting passage of this bill before taking definite action in that direction—hence a delay rather than a flat "no" on answering the tariff increase proposal, some industry sources believe.

COPPER . . . With June shipments of brass and bronze ingot at 22,3[illegible] tons, the rate continues almost unchanged from May when shipments totaled 22,269 tons. This brings the first half total for the secondary brass and bronze industry to 133,597 tons, down 8.3 pct from first half 1953 but 6.3 pct better than second half of last year when the slump was at its worst.

July tonnage will definitely be off as a result of many plant-wide vacation shutdowns by ingot consumers but a rebound is definitely expected for August.

In the copper market, London was shaky last week as a result of heavy sales in Europe by Chile. Since the market is in a seasonally slow period the effect was greater than usual and some concern has been expressed in trade circles here.

Custom smelters late last week reduced buying prices for copper scrap ¼¢. This firmly established No. 2 scrap at the 25½¢ level.

Wage negotiations between Kennecott Copper Co. and International Union of Mine, Mill & Smelter Workers were resumed last week following a vacation shutdown.

ALUMINUM . . . Ingot makers last week boosted quotations on some grades of secondary aluminum by ¼ to ½¢ to reflect recent increases in their scrap buying prices. Grades affected were 95-5 aluminum-silicon, No. 13 alloy and steel deoxidizing aluminum.

In primary aluminum, the big question is still the labor settlement. Meetings continued in secrecy last week and at presstime no word of settlement had been received. But an announcement must be made this week (contracts expire July 31) and it's expected to follow the pattern set in steel.

TIN . . . Prices in all world markets were sailing along, making slight but steady gains until the news came last week of the Indo-China truce. Then since tin is ever sensitive to Far Eastern political situations, the price dropped 2.25¢ in the 2 days following the truce announcement. Price then rebounded, and since has continued to rise, reaching 97¢ early this week. But trading at the start of the week was dull, and some feared the rebound might have begun to peter out.

NONFERROUS METAL PRICES

(Cents per lb except as noted)

	July 21	July 22	July 23	July 24	July 26	July 27
Copper, electro, Conn.	30.00	30.00	30.00	30.00	30.00	30.00
Copper, Lake, delivered	30.00	30.00	30.00	30.00	30.00	30.00
Tin Straits, New York	95.50	95.75	96.75	....	97.00	97.00*
Zinc, East St. Louis	11.00	11.00	11.00	11.00	11.00	11.00
Lead, St. Louis	13.80	13.80	13.80	13.80	13.80	13.80

Note: Quotations are going prices
*Tentative

Nonferrous Prices

(Effective July 27, 1954)

MILL PRODUCTS

(Cents per lb, unless otherwise noted)

Aluminum

(Base 30,000 lb, f.o.b. ship. pt. frt. allowed)

Flat Sheet: 0.136 in. and thicker, 2S, 3S, .96; 4S, 36.0¢; 52S, 38.2¢; 24S-O, 24S-OAL, .96; 75S-O, 75S-OAL, 44.7¢; 0.081-in., 2S, 3S, .96; 75S-O, 75S-OAL, 46.9¢; 0.032-in., 2S, 3S, .16; 4S, 37.7¢; 52S, 39.9¢; 24S-O, 24S-OAL, .64; 75S-O, 75S-OAL, 46.9¢; 0.032-in., 2S, 3S, .96; 4S, 41.8¢; 24S-O, 24S-OAL, 46.9¢; 75S-O, 75S-OAL, 58.4¢.

Plate, ¼-in., and Heavier: 2S-F, 3S-F, 32.4¢; 52-F, 34.5¢; 52S-F, 36.2¢; 61S-O, 35.6¢; 24S-O, 75S-OAL, 36.9¢; 75S-O, 75S-OAL, 44.3¢.

Extruded Solid Shapes: Shape factors 1 to 36.5¢ to 82.8¢; 12 to 14, 37.2¢ to 99.0¢; 24 25, 39.5¢ to $1.29; 36 to 38, 47.2¢ to $1.89.

Rod, Rolled: 1.064 to 4.5-in., 2S-F, 3S-F, .4¢ to 37.2¢; cold-finished, 0.375 to 3.449-in., S-F, 3S-F, 47.6¢ to 39.3¢.

Screw Machine Stock: Rounds, 11S-T3, ½ to .31-in., 69.6¢ to 47.0¢; ⅝ to 1½-in., 46.6¢ to .84; 1 9/16 to 3-in., 42.7¢ to 39.9¢. Base 00 lb.

Drawn Wire: Coiled 0.051 to 0.374-in., 2S, .1¢ to 32.4¢; 52S, 53.4¢ to 39.1¢; 17S-T4, .1¢ to 41.8¢; 61S-T4, 53.9¢ to 41.3¢.

Extruded Tubing: Rounds, 63S-T5, OD 1¼ 2-in., 31.6¢ to 60.7¢; 2 to 4 in., 37.7¢ to .1¢; 4 to 6 in., 38.2¢ to 46.6¢; 6 to 9 in., .7¢ to 48.8¢.

Roofing Sheet: Flat, per sheet, 0.032-in., 42¾ 60 in., $2.838; x 96 in., $4.543; x 120 in., .680; x 144 in., $6.816. Coiled sheet, per lb, .019 in., x 28 in., 30.8¢.

Magnesium

(F.o.b. mill, freight allowed)

Sheet & Plate: FS1-O ¼ in., 56¢; 3/16 in., .2¢; ⅛ in., 60¢ 0.064 in., 73¢; 0.032 in., 94¢. pecification grade higher. Base 30,000 lb.

Extruded Round Rod: M, diam ¼ to 0.311 ., 77¢; ½ to ¾ in., 60.5¢; 1¼ to 1.749 in., ¢; 2½ to 5 in., 51.5¢; Other alloys higher. ase up to ⅜ in. diam, 10,000 lb; ¾ to 2 in., ,000 lb; 2 in. and larger, 30,000 lb.

Extruded Solid Shapes: Rectangles: M. In eight per ft, for perimeters less than size in- cated; 0.10 to 0.11 lb, 3.5 in., 65.3¢; 0.22 to .25 lb, 8.9 in., 62.3¢; 0.50 to 0.59 lb, 8.6 in., .7¢; 1.8 to 2.59 lb, 19.5 in., 56.8¢; 4 to 6 , 28 in., 52¢. Other alloys higher. Base, in eight per ft of shape: Up to ½ lb, 10,000 lb; to 1.80 lb, 20,000 lb; 1.80 lb and heavier, ,000 lb.

Extruded Round Tubing: M, 0.049 to 0.057 . wall thickness: OD, ¼ to 5/16 in., $1.43; /16 to ⅜ in., $1.29; ½ to ⅝ in., 96¢; 1 to 2 ., 79¢; 0.165 to 0.219 in. wall; OD, ⅝ to ¾ ., 64¢; 1 to 2 in., 60¢; 3 to 4 in., 59¢. Other loys higher. Base, OD: Up to 1½ in., 10,000 ; 1½ to 3 in., 20,000 lb; over 3 in., 30,000 lb.

Titanium

(10,000 lb base, f.o.b. mill)

Commercially pure and alloy grades; Sheets nd strip, HR or CR, $15; Plate, HR, $12; ire, rolled and/or drawn, $11; Bar, HR or rged, $6; Forgings, $6.

Nickel, Monel, Inconel

(Base prices, f.o.b. mill)

	"A" Nickel	Monel	Inconel
Sheet, CR	86½	67½	92½
Strip, CR	92½	70½	98½
Rod, bar	82½	65½	88½
Angles, HR	82½	65½	88½
Plate, HR	84½	66½	90½
Seamless tube	115½	100½	137½
Shot, blocks	....	60	....

Copper, Brass, Bronze

(Freight included on 500 lb)

	Sheet	Rods	Extruded Shapes
Copper	46.41	....	48.48
Copper, h-r	48.38	44.73	....
Copper, drawn	....	45.98	....
Low brass	44.47	44.41	....
Yellow brass	41.72	41.66	....
Red brass	45.44	45.38	....
Naval brass	45.76	40.07	....
Leaded brass	....	....	39.11
Com. bronze	46.95	46.89	....
Mang. bronze	49.48	43.62	45.18
Phos. bronze	66.58	67.08	....
Muntz metal	43.96	39.77	41.02
Nl silver, 10 pct	55.36	....	62.63

Beryllium copper, CR, 1.9% Be, Base 2000 lb, f.o.b.

Strip	$1.68
Rod, bar, wire	1.65

PRIMARY METALS

(Cents per lb, unless otherwise noted)

Aluminum ingot, 99+%, 10,000 lb, freight allowed	21.50
Aluminum pig	20.00
Antimony, American, Laredo, Tex.	28.50
Beryllium copper, per lb conta'd be.	$40.00
Beryllium aluminum 5% Be, Dollars per lb contained Be	$72.75
Bismuth, ton lots	$2.25
Cadmium, del'd	$1.70
Cobalt, 97-99% (per lb)	$2.60 to $2.67
Copper, electro, Conn. Valley	30.00
Copper, Lake, delivered	30.00
Gold, U. S. Treas., per troy oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$165 to $175
Lead, St. Louis	13.80
Lead, New York	14.00
Magnesium, 99.8+%, f.o.b. Freeport, Tex., 10,000 lb, pig	27.00
ingot	27.75
Magnesium, sticks, 100 to 500 lb,	46.00 to 48.00
Mercury, dollars per 76-lb flask, f.o.b. New York	$290.00
Nickel electro, f.o.b. N. Y. warehouse	63.08
Nickel oxide sinter, at Copper Creek, Ont., contained nickel	56.25
Palladium, dollars per troy oz.	$21.00
Platinum, dollars per troy oz.	$84 to $87
Silver, New York, cents per troy oz.	85.25
Tin, New York	97.00
Titanium, sponge, grade A-1	$4.72
Zinc East St. Louis	11.00
Zinc New York	11.50
Zirconium copper, 50 pct	$6.20

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5-5 ingot	
No. 115	27.00
No. 120	26.25
No. 123	25.75
80-10-10 ingot	
No. 305	31.50
No. 315	29.25
88-10-2 ingot	
No. 210	41.25
No. 215	37.75
No. 245	33.25
Yellow ingot	
No. 405	23.25
Manganese bronze	
No. 421	26.75

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys	
0.30 copper, max.	23.00-23.25
0.60 copper, max.	22.50-22.75
Piston alloys (No. 122 type)	20.00-21.25
No. 12 alum. (No. 2 grade)	19.25-19.75
108 alloy	20.00-20.50
195 alloy	21.00-21.50
13 alloy (0.60 copper max.)	22.50-22.75
ASX-679	20.00-20.50

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—96-97½%	20.50-21.00
Grade 2—92-95%	19.50-20.25
Grade 3—90-92%	18.75-19.25
Grade 4—85-90%	17.50-18.00

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, freight allowed, 5000 lb lots)

Copper	
Cast, oval, 15 in. or longer	42.64
Electrodeposited	41.88
Flat rolled	45.04
Brass, 80-20	
Cast, oval, 15 in. or longer	43.515
Zinc, flat cast	20.25
Ball, anodes	18.50
Nickel, 99 pct plus	
Cast	84.00
Cadmium	$1.70
Silver 999 fine, rolled, 100 oz. lots per troy oz., f.o.b. Bridgeport, Conn.	94⅛

Chemicals

(Cents per lb, f.o.b. shipping points)

Copper cyanide, 100 lb drum	63.00
Copper sulfate, 99.5 crystals, bbl.	12.35
Nickel salts, single or double, 4-100 lb bags, frt. allowed	30.00
Nickel chloride, 375 lb drum	38.00
Silver cyanide, 100 oz. lots, per oz.	75½
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc cyanide, 100 lb drum	54.30

SCRAP METALS

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	26	25¼
Yellow brass	19¾	18
Red brass	23	22¼
Comm. bronze	23⅞	23½
Mang. bronze	18¼	17½
Yellow brass rod ends	19½	....

Custom Smelters' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	27
No. 2 copper wire	25½
Light copper	24
*Refinery brass	23

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	27
No. 2 copper wire	25½
Light copper	24
No. 1 composition	21½
No. 1 comp. turnings	20½
Rolled brass	17
Brass pipe	18½
Radiators	17¾—18
Aluminum	
Mixed old cast	13 —13½
Mixed new clips	13½—14
Mixed turnings, dry	13¼—13½
Pots and pans	13 —13½

Dealers' Scrap

(Dealers' buying price, f.o.b. New York in cents per pound)

Copper and Brass	
No. 1 heavy copper and wire	24½—25
No. 2 heavy copper and wire	23 —23½
Light copper	21 —21½
New type shell cuttings	20½
Auto radiators (unsweated)	15
No. 1 composition	19 —19½
No. 1 composition turnings	18½—19
Unlined red car boxes	16
Cocks and faucets	16 —16½
Mixed heavy yellow brass	13
Old rolled brass	15½
Brass pipe	16½—17
New soft brass clippings	18
Brass rod ends	16
No. 1 brass rod turnings	15
Aluminum	
Alum. pistons and struts	7 — 8
Aluminum crankcases	10
2S aluminum clippings	13
Old sheet and utensils	10
Borings and turnings	6 — 7
Misc. cast aluminum	10
Dural clips (24S)	11
Zinc	
New zinc clippings	6 — 6½
Old zinc	4¾— 5
Zinc routings	3 — 3½
Old die cast scrap	3 — 3¼
Nickel and Monel	
Pure nickel clippings	60 —65
Clean nickel turnings	40
Nickel anodes	60 —65
Nickel rod ends	60 —65
New Monel clippings	23 —25
Clean Monel turnings	16 —18
Old sheet Monel	21 —23
Nickel silver clippings, mixed	15
Nickel silver turnings, mixed	13
Lead	
Soft scrap lead	11 —11¼
Battery plates (dry)	5¾— 6
Batteries, acid free	4¼
Magnesium	
Segregated solids	18½—19
Castings	17½—18
Miscellaneous	
Block tin	75 —80
No. 1 pewter	55 —60
No. 1 auto babbitt	48
Mixed common babbitt	12 —12½
Solder joints	16½
Siphon tops	45
Small foundry type	15½
Monotype	14
Lino. and stereotype	13
Electrotype	11½
Hand picked type shells	8½
Lino. and stereo. dross	5½
Electro dross	4

Comparison of Prices

(Effective July 27, 1954)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland Youngstown.

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

	July 27 1954	July 20 1954	June 29 1954	July 28 1953
Flat-Rolled Steel: (per pound)				
Hot-rolled sheets	4.05¢	4.05¢	3.925¢	3.925¢
Cold-rolled sheets	4.95	4.95	4.775	4.775
Galvanized sheets (10 ga.)	5.45	5.45	5.275	5.275
Hot-rolled strip	4.05	4.05	3.925	3.925
Cold-rolled strip	5.82	5.82	5.513	5.575
Plate	4.237	4.237	4.10	4.10
Plates wrought iron	9.30	9.30	9.30	9.00
Stainl's C-R strip (No. 302)	41.50	41.50	41.50	41.50
Tin and Terneplate: (per base box)				
Tinplate (1.50 lb.) cokes	$8.95	$8.95	$8.95	$8.95
Tinplate, electro (0.50 lb.)	7.65	7.65	7.65	7.65
Special coated mfg. ternes	7.75	7.75	7.75	7.75
Bars and Shapes. (per pound)				
Merchant bars	4.312¢	4.312¢	4.16¢	4.15¢
Cold-finished bars	5.40	5.40	5.22	5.20
Alloy bars	5.075	5.075	4.875	4.875
Structural shapes	4.25	4.25	4.10	4.10
Stainless bars (No. 302)	35.50	35.50	35.50	35.50
Wrought iron bars	10.40	10.40	10.40	10.05
Wire: (per pound)				
Bright wire	5.75¢	5.75¢	5.525¢	5.525¢
Rails: (per 100 lb.)				
Heavy rails	$4.45	$4.45	$4.325	$4.325
Light rails	5.35	5.35	5.20	5.20
Semifinished Steel: (per net ton)				
Rerolling billets	$64.00	$64.00	$62.00	$62.00
Slabs, rerolling	64.00	64.00	62.00	62.00
Forging billets	78.00	78.00	75.50	75.50
Alloy blooms, billets, slabs	86.00	86.00	82.00	82.00
Wire Rod and Skelp: (per pound)				
Wire rods	4.675¢	4.675¢	4.525¢	4.525¢
Skelp	3.90	3.90	3.75	3.75
Finished Steel Composite: (per pound)				
Base price	4.801¢	4.801¢	4.634¢	4.634¢

	July 27 1954	July 20 1954	June 29 1954	July 28 1953
Pig Iron: (per gross ton)				
Foundry, del'd Phila.	$61.19	$61.19	$61.19	$62.19
Foundry, Valley	56.50	56.50	56.50	56.50
Foundry, Southern, Cin'ti	60.43	60.43	60.43	60.43
Foundry, Birmingham	52.88	52.88	52.88	52.88
Foundry, Chicago	56.50	56.50	56.50	56.50
Basic del'd. Philadelphia	60.27	60.27	60.27	61.27
Basic, Valley furnace	56.00	56.00	56.00	56.00
Malleable, Chicago	56.50	56.50	56.50	56.50
Malleable, Valley	56.50	56.50	56.50	56.50
Ferromanganese‡, cents per lb.	10.00¢	10.00¢	10.00¢	10.00¢
‡ 76 pct Mn base.				
Pig Iron Composite: (per gross ton)				
Pig iron	$56.59	$56.59	$56.59	$56.76
Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	$28.50	$28.50	$28.50	$46.50
No. 1 steel, Phila. area	24.00	23.50	22.75	44.25
No. 1 steel, Chicago	29.50	28.50	29.50	44.00
No. 1 bundles, Detroit	22.00	22.00	22.50	48.50
Low phos., Youngstown	30.50	30.50	29.50	48.50
No. 1 mach'y cast, Pittsburgh	42.50	42.50	42.50	49.50
No. 1 mach'y cast, Philadel'a	39.50	39.50	39.50	46.50
No. 1 mach'y cast, Chicago	39.50	39.50	39.50	46.50
Steel Scrap Composite: (per gross ton)				
No. 1 heavy melting scrap	$27.33	$26.83	$26.92	$44.92
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.38	$14.38	$14.38	$14.75
Foundry coke, prompt	16.75	16.75	16.75	17.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	30.00	30.00	30.00	29.875
Copper, Lake, Conn.	30.00	30.00	30.00	30.125
Tin, Straits, New York	97.00†	96.625*	96.50	78.25
Zinc, East St. Louis	11.00	11.00	11.00	11.00
Lead, St. Louis	13.80	13.80	13.80	13.55
Aluminum, virgin ingot	21.50	21.50	21.50	21.50
Nickel, electrolytic	63.08	63.08	63.08	63.08
Magnesium, ingot	27.75	27.75	27.75	27.00
Antimony, Laredo, Tex.	28.50	28.50	28.50	34.50

† Tentative. ‡ Average. * Revised.

Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Steel Scrap Composite

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

← To identify producers, see Key on P. 181 →

Producing Point	Basic	Fdry.	Mall.	Bess.	Low Phos.
Bethlehem *B3*	58.00	58.50	59.00	59.50	.....
Birmingham *R3*	52.38	52.88	.....	.....	.....
Birmingham *W9*	52.38	52.88	.....	.....	.....
Birmingham *U4*	52.38	52.88	56.50	.....	.....
Buffalo *R3*	56.00	56.50	57.00	.....	.....
Buffalo *H1*	56.00	56.50	57.00	.....	.....
Buffalo *W6*	56.00	56.50	57.00	.....	.....
Chicago *I4*	56.00	56.50	56.50	57.00	.....
Cleveland *A5*	56.00	56.50	56.50	57.00	61.00
Cleveland *R3*	56.00	56.50	56.50	.....	.....
Daingerfield *L3*	52.50	52.50	52.50	.....	.....
Duluth *I4*	56.00	56.50	56.50	57.00	.....
Erie *I4*	56.00	56.50	56.50	57.00	.....
Everett *M6*	.....	61.00	61.50	.....	.....
Fontana *K1*	62.00	62.50	.....	.....	.....
Geneva, Utah *C7*	56.00	56.50	.....	.....	.....
Granite City *G2*	57.90	58.40	58.90	.....	.....
Hubbard *Y1*	.....	.....	56.50	.....	.....
Minnequa *C6*	58.00	59.00	59.00	.....	.....
Monessen *P6*	56.00	.....	.....	.....	.....
Neville Isl. *P4*	56.00	56.50	56.50	.....	.....
Pittsburgh *U1*	56.00	.....	.....	57.00	.....
Sharpsville *S3*	56.00	56.50	56.50	57.00	.....
Steelton *B3*	58.00	58.50	59.00	59.50	64.00
Swedeland *A2*	58.00	58.50	59.00	59.50	.....
Toledo *I4*	56.00	56.50	56.50	57.00	.....
Troy, N. Y. *R3*	58.00	58.50	59.00	59.50	64.00
Youngstown *Y1*	.....	.....	56.50	57.00	.....
N. Tonawanda *T1*	.....	56.50	57.00	.....	.....

DIFFERENTIALS: Add 50¢ per ton for each 0.25 pct silicon over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct) 50¢ per ton for each 0.50 pct manganese over 1 pct., $2 per ton for .05 to 0.75 pct nickel, $1 for each additional 0.25 pct nickel. Subtract 38¢ per ton for phosphorus, content 0.70 and over.

Silvery Iron: Buffalo, *H1*, $68.25; Jackson, *J1, G1*, $67.00. Add $1.50 per ton for each 0.50 pct silicon over base (6.01 to 6.50 pct) up to 17 pct. Add $1 per ton for 0.75 pct. or more phosphorus. Add 75¢ for each 0.50 pct. manganese over 1.0 pct. Bessemer ferrosilicon prices are $1 over comparable silvery iron.

STAINLESS STEEL

Base price cents per lb. f.o.b. mill

Product	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	16.25	17.25	18.75	18.25	28.00	22.75	24.50	14.00	.....	14.25
Slabs, billets, rerolling	20.50	22.75	24.75	23.75	36.25	29.50	32.25	18.25	.....	18.50
Forg. discs, die blocks, rings	38.50	38.50	41.50	40.50	60.00	45.50	50.75	31.00	31.75	31.75
Billets, forging	29.50	29.75	32.25	31.00	46.50	35.25	39.50	24.00	24.50	24.50
Bars, wires, structurals	35.25	35.50	38.25	37.25	55.50	42.00	46.75	28.75	29.25	29.25
Plates	37.25	37.50	39.75	39.75	58.75	45.75	51.25	30.00	30.50	30.50
Sheets	41.25	41.50	48.75	43.75	62.75	50.50	59.25	34.25	41.25	34.75
Strip, hot-rolled	29.75	32.00	36.75	34.25	53.25	41.00	46.50	28.25	.....	27.00
Strip, cold-rolled	38.25	41.50	45.50	43.75	62.75-63.00	50.50-50.75	59.25	34.25	41.25	34.75

STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., *C11;* Brackenridge, Pa., *A3;* Butler, Pa., *A7;* McKeesport, Pa., *U1;* Washington, Pa., *W2, J2;* Baltimore, *E1;* Middletown, O., *A7;* Massillon, O., *R3;* Gary, *U1;* Bridgeville, Pa., *U2;* New Castle, Ind., *I2;* Ft. Wayne, *J4.*

Strip: Midland, Pa., *C11;* Cleveland, *A5;* Carnegie, Pa., *S9;* McKeesport, Pa., *F1;* Reading, Pa., *C2;* Washington, Pa., *W2;* W. Leechburg, Pa., *A3;* Bridgeville, Pa., *U2;* Detroit, *M2;* Canton-Massillon, O., *R3;* Middletown, O., *A7;* Harrison, N. J., *D3;* Youngstown, *C5;* Sharon, Pa., *S1;* Butler, Pa., *A7;* Wallingford, Conn., *U3* (.25¢ per lb higher) *W1* (.25¢ per lb higher); New Bedford, Mass., *R6.*

Bar: Baltimore, *A7;* Duquesne, Pa., *U1;* Munhall, Pa., *U1;* Reading, Pa., *C2;* Titusville, Pa., *U2;* Washington, Pa., *J2;* McKeesport, Pa., *U1, F1;* Bridgeville, Pa., *U2;* Dunkirk, N. Y., *A3;* Massillon, O., *R3;* Chicago, *U1;* Syracuse, N. Y., *C11;* Watervliet, N. Y., *A3;* Waukegan, *A5;* Canton, O., *T5;* Ft. Wayne, *I4.*

Wire: Waukegan, *A5;* Massillon, O., *R3;* McKeesport, Pa., *F1;* Ft. Wayne, *J4;* Harrison, N. J., *D3;* Baltimore, *A7;* Dunkirk, *A3;* Monessen, *P1;* Syracuse, *C11;* Bridgeville, *U2.*

Structurals: Baltimore, *A7;* Massillon, O., *R3;* Chicago, Ill., *J4;* Watervliet, N. Y., *A3;* Syracuse, *C11.*

Plates: Brackenridge, Pa., *A3;* Chicago, *U1;* Munhall, Pa., *U1;* Midland, Pa., *C11;* New Castle, Ind., *I2;* Middletown, *A7;* Washington, Pa., *J2;* Cleveland, Massillon, *R3;* Coatesville, Pa., *C15.*

Forged discs, die blocks, rings: Pittsburgh, *C11;* Syracuse, *C11;* Ferndale, Mich., *A3;* Washington, Pa., *J2.*

Forging billets: Midland, Pa., *C11;* Baltimore, *A7;* Washington, Pa., *J2;* McKeesport, *F1;* Massillon, Canton, O., *R3;* Watervl'et, *A3;* Pittsburgh, Chicago, *U1;* Syracuse, *C11.*

Market Upturn Could Come Soon

Steelmaking grades rise in Chicago, Philadelphia, New York . . . Lay down scrap in other areas . . . Exports strengthen market in East . . . Scrap Composite rises 50¢ to $27.33.

You couldn't say that scrap traders were dancing in the streets just yet, but early this week there were definite (although scattered) signs that a considerably stronger market is on the way.

A major item was increased mill buying in Chicago, particularly by smaller mills. Tonnages weren't too heavy, but increased activity by smaller mills is definitely encouraging to dealers and brokers. Talk was of some price increases in the next 2 weeks, and there were reports of laying down scrap against higher prices.

Laying down of scrap was not confined to Chicago, but cropped up in reports from other consuming districts. Notable exception was the East Coast, where export orders have become a major factor in the market. Philadelphia mills, for example, are making no attempt to match export offers, but still had to pay 50¢ to $1 more for their scrap.

THE IRON AGE Heavy Melting Steel Scrap Composite rose 50¢ to $27.33. With the steel industry expecting a robust fourth quarter, it could keep climbing.

Pittsburgh . . . Despite consumer disinterest, prices are holding firm momentarily. It is a toss-up in the minds of observers whether the next buy will be at lower-than-current prices. Export activity in the East has indirectly strengthened the local market by siphoning off excess tonnages, although brokers here say they cannot participate due to freight to the East. Consumer inventories in the district are still high. Prices are unchanged.

Chicago . . . Though mill ordering continued very light, Chicago scrap began to take a healthier tone and dealer asking prices were on the climb last week. Although mill prices on railroad grades continued low, some roads were receiving better bids. Sources who had expected no relief "before Labor Day," were now looking forward to increased purchasing, and at good prices, within 2 weeks. Sparking some of the optimism were purchases by smaller mills, but tonnages and prices didn't yet sustain the amount of new life in the market. At least some scrap was again being put down against a prospective price rise within the next month, though advances are expected to be small.

Philadelphia . . . Siphoning off of fair-sized tonnages for export continued to bolster the market in this area. Export tonnages were going at prices substantially above domestic levels, and domestic consumers weren't trying to match the export bids. But steelmaking grades edged up 50¢ to $1 just the same. Low phos grades also sold for $1 more. There was no change in railroad and cast grades.

New York . . . Domestic business in steelmaking grades continued slow, but export demand kept the trade busy. No. 1 steel, in relatively short supply here, rose $1.50 per ton on the basis of brokers' offers to dealers. Other steelmaking grades were also in demand for export, but supplies were easier. Cast continued to move at earlier levels, while blast furnace grades were holding on, but moving slowly.

Detroit . . . With scrap movement continuing dull here, reports persisted that at least some scrap was being laid away at present prices in hope of a firming price in the future. There were indications that foundry scrap might be firming slightly, but this was not confirmed by any great strength in the pricing of the grade and scattered prices, and sales continued. General feeling that there will be little change in the tone of the market until well into August continues.

Cleveland . . . Cleveland and Valley markets remained quiet this week. Mills still aren't showing any interest in scrap and there is very little speculation. Full effects of vacation slowdowns have not yet been felt.

Birmingham . . . Cast scrap is badly needed by foundries reopening after summer vacations but the supply in the South is short of demands. Brokers are attempting to make purchases outside the district in areas where there may be a weakness in the market, especially where water transportation is available. Steel mills in the district have placed their orders for the month and are out of the market, but there is some export activity in South Carolina for shipment through Charleston.

St. Louis . . . Additional drop in the district steel rate to 47.4 pct further curtailed mill buying, which has been only sufficient to cover the melt, but prices generally are unchanged except for No. 1 RR heavy melting, competitive bidding upping it $1 a ton.

Cincinnati . . . Dealers and brokers in this area were awaiting August buying prices at press time. Complete absence of local buying kept trading at a virtual standstill and prices nominal.

Buffalo . . . With dealers busy shipping against recent orders the scrap market here maintains a steady undertone. New buying was placed in short shoveling turnings at current prices. Cast market continues weak. Water receipts are expected to be at the lowest level in years.

Boston . . . Market was extremely quiet reflecting the usual midsummer slump. Only new development concerned increase in freight rates which went into effect July 20. Mills are absorbing the higher cost. Shipper gets the break if he ships a maximum 40-ton carload.

West Coast . . . Cast market continues hottest scrap item on coast with heavy demand for soil pipe and plumbing. Vacations in a few larger production foundries in next few weeks will help ease hot demand for little remaining.

Scrap Prices

(Effective July 27, 1954)

Pittsburgh

No. 1 hvy. melting	$28.00 to $29.00
No. 2 hvy. melting	25.00 to 26.00
No. 1 bundles	28.00 to 29.00
No. 2 bundles	23.00 to 24.00
Machine shop turn.	14.00 to 15.00
Mixed bor. and ms. turns.	14.00 to 15.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	18.00 to 19.00
Low phos. punch'gs, plate	31.00 to 32.00
Heavy turnings	26.00 to 27.00
No. 1 RR. hvy. melting	31.00 to 32.00
Scrap rails, random lgth.	36.00 to 37.00
Rails 2 ft and under	42.00 to 43.00
RR. steel wheels	34.00 to 35.00
RR. spring steel	34.00 to 35.00
RR. couplers and knuckles	34.00 to 35.00
No. 1 machinery cast.	42.00 to 43.00
Cupola cast.	34.00 to 35.00
Heavy breakable cast.	30.00 to 31.00

Chicago

No. 1 hvy. melting	$29.00 to $30.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 factory bundles	31.00 to 32.00
No. 1 dealers' bundles	28.00 to 29.00
No. 2 dealers' bundles	21.00 to 23.00
Machine shop turn.	12.00 to 13.00
Mixed bor. and turn.	14.00 to 15.00
Shoveling turnings	14.00 to 15.00
Cast iron borings	14.00 to 15.00
Low phos. forge crops	34.00 to 35.00
Low phos. punch'gs, plate	32.00 to 33.00
Low phos. 3 ft and under	31.00 to 32.00
No. 1 RR. hvy. melting	32.00 to 33.00
Scrap rails, random lgth.	36.00 to 37.00
Rerolling rails	42.00 to 43.00
Rails 2 ft and under	43.00 to 44.00
Locomotive tires, cut	33.00 to 34.00
Cut bolsters & side frames	35.00 to 36.00
Angles and splice bars	37.00 to 38.00
RR. steel car axles	40.00 to 41.00
RR. couplers and knuckles	35.00 to 36.00
No. 1 machinery cast.	39.00 to 40.00
Cupola cast	36.00 to 37.00
Heavy breakable cast.	29.00 to 30.00
Cast iron brake shoes	31.00 to 32.00
Cast iron car wheels	33.00 to 34.00
Malleable	40.00 to 41.00
Stove plate	30.00 to 31.00

Philadelphia Area

No. 1 hvy. melting	$23.50 to $24.50
No. 2 hvy. melting	21.50 to 22.50
No. 1 bundles	24.50 to 25.50
No. 2 bundles	18.00 to 19.00
Machine shop turn.	13.00 to 14.00
Mixed bor. short turn.	15.00 to 16.00
Cast iron borings	15.00 to 16.00
Shoveling turnings	16.00 to 17.00
Clean cast chem. borings.	20.00 to 21.00
Low phos. 5 ft and under	26.00 to 27.00
Low phos. 2 ft and under	27.00 to 28.00
Low phos. punch'gs	27.00 to 28.00
Elec. furnace bundles	25.00 to 26.00
Heavy turnings	23.00 to 24.00
RR. steel wheels	31.00 to 32.00
RR. spring steel	31.00 to 32.00
Rails 18 in. and under	40.00 to 41.00
Cupola cast.	34.00 to 35.00
Heavy breakable cast.	35.00 to 36.00
Cast iron carwheels	38.00 to 39.00
Malleable	36.00 to 37.00
Unstripped motor blocks.	27.00 to 28.00
No. 1 machinery cast.	39.00 to 40.00
Charging box cast.	36.00 to 37.00

Cleveland

No. 1 hvy. melting	$26.00 to $27.00
No. 2 hvy. melting	24.00 to 25.00
No. 1 bundles	26.00 to 27.00
No. 2 bundles	22.00 to 23.00
No. 1 busheling	26.00 to 27.00
Machine shop turn.	12.00 to 13.00
Mixed bor. and turn.	16.00 to 17.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Cut struct'r'l & plate, 2 ft & under	31.50 to 32.50
Drop forge flashings	26.00 to 27.00
Low phos. 2 ft & under	28.00 to 29.00
No. 1 RR. heavy melting	27.00 to 28.00
Rails 3 ft and under	42.00 to 43.00
Rails 18 in. and under	43.00 to 44.00
Railroad grate bars	27.00 to 28.00
Steel axle turnings	19.00 to 20.00
Railroad cast.	41.00 to 42.00
No. 1 machinery cast.	41.00 to 42.00
Stove plate	33.00 to 34.00
Malleable	39.00 to 40.00

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Youngstown

No. 1 hvy. melting	$28.00 to $29.00
No. 2 hvy. melting	23.00 to 24.00
No. 1 bundles	28.00 to 29.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	14.00 to 15.00
Shoveling turnings	19.00 to 20.00
Cast iron borings	19.00 to 20.00
Low phos. plate	30.00 to 31.00

Buffalo

No. 1 hvy. melting	$26.00 to $27.00
No. 2 hvy. melting	22.00 to 23.00
No. 1 busheling	26.00 to 27.00
No. 1 bundles	26.00 to 27.00
No. 2 bundles	20.00 to 21.00
Machine shop turn.	14.50 to 15.50
Mixed bor. and turn.	17.50 to 18.50
Shoveling turnings	18.00 to 18.50
Cast iron borings	17.50 to 18.50
Low phos. plate	29.00 to 30.00
Scrap rails, random lgth.	33.00 to 34.00
Rails 2 ft and under	40.00 to 41.00
RR. steel wheels	34.00 to 35.00
RR. spring steel	34.00 to 35.00
RR. couplers and knuckles	34.00 to 35.00
No. 1 machinery cast.	40.00 to 41.00
No. 1 cupola cast.	36.00 to 37.00

Detroit

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$19.50 to $20.50
No. 2 hvy. melting	16.50 to 17.50
No. 1 bundles, openhearth	21.50 to 22.50
No. 2 bundles	16.50 to 17.50
New busheling	19.50 to 20.50
Drop forge flashings	19.50 to 20.50
Machine shop turn.	6.00 to 7.00
Mixed bor. and turn.	8.00 to 9.00
Shoveling turnings	8.00 to 9.00
Cast iron borings	8.00 to 9.00
Low phos. punch'gs, plate	20.50 to 21.50
No. 1 cupola cast.	32.00
Heavy breakable cast.	23.00
Stove plate	28.00
Automotive cast.	36.00

St. Louis

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	23.50 to 24.50
No. 1 bundles	25.00 to 26.00
No. 2 bundles	19.50 to 20.50
Machine shop turn.	12.00 to 13.00
Cast iron borings	13.00 to 14.00
Shoveling turnings	13.00 to 14.00
No. 1 RR. hvy. melting	29.00 to 30.00
Rails, random lengths	34.00 to 35.00
Rails, 18 in. and under	41.00 to 42.00
Locomotive tires, uncut	30.00 to 31.00
Angles and splice bars	30.00 to 31.00
Std. steel car axles	35.00 to 36.00
RR. spring steel	30.00 to 31.00
Cupola cast.	40.00 to 41.00
Hvy. breakable cast.	29.00 to 30.00
Cast iron brake shoes	25.00 to 26.00
Stove plate	30.00 to 31.00
Cast iron car wheels	30.00 to 31.00
Malleable	35.00 to 36.00
Unstripped motor blocks.	29.00 to 30.00

New York

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$20.50 to $21.50
No. 2 hvy. melting	17.50 to 18.50
No. 2 bundles	15.00 to 16.00
Machine shop turn.	5.00 to 6.00
Mixed bor. and turn.	7.00 to 8.00
Shoveling turnings	8.00 to 9.00
Clean cast chem. borings.	14.00 to 15.00
No. 1 machinery cast.	35.00 to 36.00
Mixed yard cast.	29.00 to 30.00
Charging box cast.	29.00 to 30.00
Heavy breakable cast.	29.00 to 30.00
Unstripped motor blocks.	22.00 to 23.00

Birmingham

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	19.00
No. 1 bundles	20.00
No. 2 bundles	$15.00 to 16.00
No. 1 busheling	20.00
Machine shop turn.	15.00 to 16.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	13.00 to 14.00
Electric furnace bundles	26.00 to 27.00
Bar crops and plate	29.00 to 30.00
Structural and plate, 2 ft	29.00 to 30.00
No. 1 RR. hvy. melting	26.00 to 27.00
Scrap rails, random lgth.	34.00 to 35.00
Rails, 18 in. and under	37.50 to 38.50
Angles & splice bars	35.00 to 36.00
Rerolling rails	39.50 to 40.00
No. 1 cupola cast.	43.50 to 44.50
Stove plate	40.50 to 41.50
Charging box cast.	19.00 to 20.00
Cast iron car wheels	33.00 to 34.00
Unstripped motor blocks.	34.50 to 35.50
Mashed tin cans	15.00 to 16.00

Boston

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.00 to $16.00
No. 2 hvy. melting	13.50 to 14.25
No. 1 bundles	15.00 to 16.00
No. 2 bundles	11.00 to 12.25
No. 1 busheling	15.00 to 16.00
Elec. furnace, 3 ft & under	15.00 to 16.00
Machine shop turn.	3.00 to 4.00
Mixed bor. and short turn.	6.00 to 7.00
Shoveling turnings	8.00 to 9.00
Clean cast chem. borings.	9.00 to 10.00
No. 1 machinery cast.	27.00 to 28.00
Mixed cupola cast.	25.00 to 26.00
Heavy breakable cast.	23.50 to 24.00
Stove plate	24.00 to 25.00
Unstripped motor blocks	9.00 to 10.00

Cincinnati

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$26.00 to $27.00
No. 2 hvy. melting	23.00 to 24.00
No. 1 bundles	26.00 to 27.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	11.00 to 12.00
Mixed bor. and turn.	13.50 to 14.50
Shoveling turnings	14.00 to 15.00
Cast iron borings	14.00 to 15.00
Low phos., 18 in. & under	32.00 to 33.00
Rails, random lengths	35.00 to 36.00
Rails, 18 in. and under	43.00 to 44.00
No. 1 cupola cast.	38.00 to 39.00
Hvy. breakable cast.	34.00 to 35.00
Drop broken cast.	43.00 to 44.00

San Francisco

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	16.00
No. 1 bundles	19.00
No. 2 bundles	16.00
No. 3 bundles	12.00
Machine shop turn.	5.00
Cast iron borings	9.00
No. 1 RR. hvy. melting	23.00
No. 1 cupola cast.	$43.00 to 46.00

Los Angeles

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	16.00
No. 1 bundles	19.00
No. 2 bundles	$15.50 to 16.00
No. 3 bundles	12.00
Machine shop turn.	5.00
Shoveling turnings	7.00 to 9.00
Cast iron borings	7.00 to 9.00
Elec. fur. 1 ft and under.	25.00
No. 1 RR. hvy. melting	20.00
No. 1 cupola cast.	43.00 to 45.00

Seattle

No. 1 hvy. melting	$25.00
No. 2 hvy. melting	21.00
No. 1 bundles	21.50
No. 2 bundles	17.00
No. 3 bundles	13.00
No. 1 cupola cast.	37.00
Mixed yard cast.	35.00

Hamilton, Ont.

No. 1 hvy. melting	$22.00
No. 2 hvy. melting	19.00
No. 1 bundles	22.00
No. 2 bundles	19.00
Mixed steel scrap	16.00
Bushelings	17.00
Bush., new fact prep'd	20.00
Bush., new fact unprep'd	16.00
Short steel turnings	12.00
Mixed bor. and turn.	13.00
Rails, remelting	31.00
Cast scrap	$42.00 to 45.00

A
SYMBOL
OF
LEADERSHIP
IN
IRON & STEEL
SCRAP
SINCE
1889

Luria Brothers and Company, Inc.

MAIN OFFICE

LINCOLN-LIBERTY BLDG.

Philadelphia 7, Penna.

PLANTS

LEBANON, PENNA.
READING, PENNA.
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DETROIT (ECORSE), MICHIGAN
PITTSBURGH, PENNA.
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OFFICES

BIRMINGHAM, ALA.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILLINOIS
CLEVELAND, OHIO
DETROIT, MICHIGAN
HOUSTON, TEXAS
LEBANON, PENNA.
LOS ANGELES, CAL.
NEW YORK, N. Y.
SEATTLE, WASH.
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EXPORTS - IMPORTS — LIVINGSTON & SOUTHARD, INC., 99 Park Avenue, New York, N. Y. *Cable Address:* FORENTRACO

STEEL PRICES

(Effective July 27, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BILLETS, BLOOMS, SLABS			PIL-ING	SHAPES STRUCTURALS			STRIP					
		Carbon Rerolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.			$86.00 *B3*		4.30 *B3*	6.45 *B3*	4.30 *B3*						
	Buffalo, N. Y.	$64.00 *B3*	$78.00 *B3, R3*	$86.00 *B3, R3*	5.075 *B3*	4.30 *B3*	6.45 *B3*	4.30 *B3*	4.05 *B3,R3*	5.75 *B3,R7*	6.15 *B3*	8.425 *B3*		
	Claymont, Del.													
	Coatesville, Pa.													
	Conshohocken, Pa.								4.175 *A2*		6.15 *A2*			
	New Bedford, Mass.									6.20 *R6*				
	Harrison, N. J.													
	Johnstown, Pa.	$64.00 *B3*	$78.00 *B3*	$86.00 *B3*		4.30 *B3*	6.45 *B3*		4.05 *B3*					
	Fairless, Pa.													
	New Haven, Conn.									6.20 *D1* 6.50 *A5*				
	Phoenixville, Pa.					3.80 *P2*		3.80 *P2*						
	Sparrows Pt., Md.								4.05 *B3*	5.75 *B3*	6.15 *B3*	8.425 *B3*		
	Wallingford, Conn.									6.20 *W1*				
	Worcester, Mass. Pawtucket, R.I.									6.30 *N7* 6.60 *A5*				12.75 *A5* 12.80 *N7*
MIDDLE WEST	Alton, Ill.								4.225 *L1*					
	Ashland, Ky.								4.05 *A7*					
	Canton-Massillon, Dover, Ohio			$82.00 *T5* $86.00 *R3*										12.45 *G6*
	Chicago, Ill.	$64.00 *U1*	$78.00 *R3, U1,W8*	$86.00 *U1, W8,R3*	5.075 *U1*	4.25 *U1, W8*	6.40 *U1, Y1*	4.25 *U1*	4.05 *A1, N4, W8*	5.85 *A1*				
	Cleveland, Ohio		$78.00 *R3*							5.75 *A5,J3*		8.60 *A5*		12.45 *A5*
	Detroit, Mich.			$88.00 *R5*					4.20 *G3,M2*	5.90 *D1,D2, G3,M2,P11*	6.30 *G3*	8.35 *D2* 8.75 *G3*		
	Duluth, Minn.													
	Gary, Ind. Harbor, Indiana	$64.00 *U1*	$78.00 *U1*	$86.00 *U1, Y1*	5.075 *I3*	4.25 *I3, U1*	6.40 *U1, I3,Y1*		4.05 *I3, U1,Y1*	6.00 *I3*	6.15 *U1, I3, Y1*	8.60 *Y1*	6.70 *U1, Y1*	
	Sterling, Ill.								4.15 *N4*					
	Indianapolis, Ind.									5.90 *C5*				
	Newport, Ky.												6.70 *N5*	
	Middletown, Ohio									5.75 *A7*				
	Niles, Warren, Ohio Sharon, Pa.								4.05 *S1,R3*	5.75 *S1,R3, T4*	6.15 *S1, R3*	8.60 *S1,R3*	6.70 *S1*	12.45 *S1*
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	$64.00 *U1, J3*	$78.00 *J3, U1,C11*	$86.00 *U1, C11*	5.075 *U1*	4.25 *J3, U1*	6.40 *J3, U1*	4.25 *U1*	4.05 *S7,P6*	5.75 *B4,J3, S7*				
	Portsmouth, Ohio								4.05 *P7*	5.75 *P7*				
	Weirton, Wheeling, Follansbee, W. Va.					4.25 *W3*			4.05 *W3*	5.75 *F3, W3*	6.15 *W3*	8.60 *W3*		
	Youngstown, Ohio		$78.00 *C10*	$86.00 *Y1, C10*		4.25 *Y1*	6.40 *Y1*		4.05 *U1,Y1*	5.75 *Y1, C5*	6.15 *U1, Y1*	8.60 *Y1*	6.70 *U1, Y1*	12.45 *C5*
WEST	Fontana, Cal.	$72.00 *K1*	$86.00 *K1*	$105.00 *K1*		4.90 *K1*	7.05 *K1*	5.25 *K1*	4.825 *K1*	7.65 *K1*	7.25 *K1*		8.10 *K1*	14.55 *K1*
	Geneva, Utah		$78.00 *C7*			4.25 *C7*	6.40 *C7*							
	Kansas City, Mo.					4.85 *S2*	7.00 *S2*		4.65 *S2*				7.30 *S2*	
	Los Angeles, Torrance, Cal.		$87.50 *B2*	$106.00 *B2*		4.95 *B2, C7*	7.10 *B2*		4.80 *B2,C7*					
	Minnequa, Colo.					4.70 *C6*			5.15 *C6*					
	San Francisco, Niles, Pittsburg, Cal.		$87.50 *B2*			4.90 *B2* 4.95 *P9*	7.05 *B2*		4.80 *B2,C7*					
	Seattle, Wash.		$91.50 *B2*			5.00 *B2*	7.15 *B2*		5.05 *B2, P12*					
SOUTH	Atlanta, Ga.								4.25 *A8*					
	Fairfield, Ala. City, Birmingham, Ala.	$64.00 *T2*	$78.00 *T2*			4.25 *T2,C16* 4.28 *R3*	6.40 *T2*		4.05 *R3, T2,C16*		6.15 *T2*			
	Houston, Tex.		$85.00 *S2*	$93.00 *S2*		4.65 *S2*	6.85 *S2*		4.45 *S2*				7.10 *S2*	

IRON AGE

STEEL PRICES

(Effective July 27, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b., mill in cents per lb., unless otherwise noted. Extras apply.

	SHEETS									WIRE ROD	TINPLATE†		BLACK PLATE
	Hot-rolled *18* ga. & hvyr.	Cold-rolled	Galvanized *10* ga.	Enameling *12* ga.	Long Terne *10* ga.	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.	Hot-rolled *19* ga.		Cokes* *1.25*-lb. base box	Electro* *0.25*-lb. base box	Hollowware Enameling *29* ga.
Bethlehem, Pa.													
Buffalo, N. Y.	4.05 *B3*	4.95 *B3*				6.10 *B3*	7.50 *B3*			4.675 *W6*			
Claymont, Del.													
Coatesville, Pa.													
Conshohocken, Pa.	4.10 *A2*					6.10 *A2*							
Harrisburg, Pa.													
Hartford, Conn.													
Johnstown, Pa.										4.675 *B3*			
Fairless, Pa.	4.10 *U1*	5.00 *U1*				6.15 *U1*	7.55 *U1*				$8.80 *U1*	$7.50 *U1*	
New Haven, Conn.													
Phoenixville, Pa.													
Sparrows Pt., Md.	4.05 *B3*	4.95 *B3*	5.45 *B3*			6.10 *B3*	7.50 *B3*	8.20 *B3*		4.775 *B3*	$8.80 *B3*	$7.50 *B3*	
Worcester, Mass.										4.975 *A5*			
Trenton, N. J.													
Alton, Ill.										4.85 *L1*			
Ashland, Ky.	4.05 *A7*		5.45 *A7*	5.375 *A7*									
Canton-Massillon, Dover, Ohio			5.45 *R1,R3*						5.175 *R1*				
Chicago, Joliet, Ill.	4.05 *A1, W8*					6.10 *U1*				4.675 *A5, N4,R3*			
Sterling, Ill.										4.775 *N4*			
Cleveland, Ohio	4.05 *J3, R3*	4.95 *J3, R3*		5.375 *R3*		6.10 *J3, R3*	7.50 *J3, R3*			4.675 *A5*			
Detroit, Mich.	4.20 *G3, M2*	5.10 *G3*				6.25 *G3*	7.65 *G3*						
Newport, Ky.	4.06 *N5*		5.45 *N5*										
Gary, Ind. Harbor, Indiana	4.05 *I3, U1,Y1*	4.95 *I3, U1,Y1*	5.45 *U1, I3*	5.375 *I3, U1*	5.85 *U1*	6.10 *U1,I3, Y1*	7.50 *U1, Y1*				$8.70 *I3, U1,Y1*	$7.40 *I3, U1*	6.10 *U1, Y1*
Granite City, Ill.	4.25 *G2*	5.15 *G2*	5.65 *G2*	5.575 *G2*								$7.60 *G2*	6.30 *G2*
Kokomo, Ind.	4.15 *C9*		5.55 *C9*						5.20 *C9*	4.775 *C9*			
Mansfield, Ohio					5.85 *E2*				5.175 *E2*				
Middletown, Ohio		4.95 *A7*		5.375 *A7*	5.85 *A7*								
Niles, Ohio Sharon, Pa.	4.05 *S1,R3* 5.30 *N3*	4.95 *R3* 5.975 *N3*	5.45 *N3*	6.725 *N3*	5.85 *N3*	6.10 *S1,R3*	7.50 *R3*				$8.70 *R3*	$7.40 *R3*	
Pittsburgh, Pa. Midland, Pa. Butler, Pa.	4.05 *J3, U1,P6*	4.95 *J3, U1,P6*	5.45 *U1*	5.375 *U1*		6.10 *J3, U1*	7.50 *J3, U1*	8.20 *U1*		4.675 *A5* 4.875 *P6*	$8.70 *J3, U1*	$7.40 *J3, U1*	6.10 *U1*
Portsmouth, Ohio	4.05 *P7*	4.95 *P7*								4.675 *P7*			
Weirton, Wheeling, Follansbee, W. Va.	4.05 *W3, W5*	4.95 *W3, W5,F3*	5.45 *W3, W5*		5.85 *W3, W5*	6.10 *W3*	7.50 *W3*				$8.70 *W3, W5*	$7.40 *W3, W5*	6.10 *F3, W5*
Youngstown, Ohio	4.05 *U1, Y1*	4.95 *Y1*		5.375 *Y1*		6.10 *U1, Y1*	7.50 *Y1*			4.675 *Y1*			
Fontana, Cal.	4.825 *K1*	6.05 *K1*				6.875 *K1*	8.55 *K1*			5.475 *K1*			
Geneva, Utah	4.15 *C7*					6.45 *C7*							
Kansas City, Mo.													
Los Angeles, Torrance, Cal.										5.475 *C7, B2*			
Minnequa, Colo.										4.925 *C6*			
San Francisco, Niles, Pittsburg, Cal.	4.75 *C7*	5.90 *C7*	6.20 *C7*							5.325 *C7*	$9.45 *C7*	$8.15 *C7*	
Seattle, Wash.													
Atlanta, Ga.													
Fairfield, Ala. Alabama City, Ala.	4.05 *R3, T2*	4.95 *T2*	5.45 *R3, T2*			6.10 *T2*			5.35 *R3*	4.675 *T2, R3*	$8.80 *T2*	$7.50 *T2*	
Houston, Texas	4.45 *S2*									5.075 *S2*			

EAST — MIDDLE WEST — WEST — SOUTH

† Special coated mfg. terne deduct 95¢ from 1.25-lb coke base box price. Can-making quality blackplate 55 to 128 lb deduct $2.20 from 1.25-lb coke base box.

* COKES: 1.50 lb add 25¢.

ELECTRO: 0.50-lb add 25¢; 0.75-lb add 65¢; 1.00-lb add $1.20.

STEEL PRICES

(Effective July 27, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BARS						PLATES				WIRE
		Carbon Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	Hi Str. Low Alloy	Mfg'n. Bright
EAST	Bethlehem, Pa.				5.075 *B3*	6.625 *B3*	6.45 *B3*					
	Buffalo, N. Y.	4.30 *B3* 4.33 *R3*	4.30 *B3* 4.33 *R3*	5.45 *B5*	5.075 *B3* 5.105 *R3*	6.625 *B3,B5*	6.45 *B3*	4.225 *B3*			6.45 *B3*	5.75 *W6*
	Claymont, Del.							4.225 *C4*		5.80 *C4*		
	Coatesville, Pa.							4.225 *L4*		5.80 *L4*		
	Conshohocken, Pa.							4.225 *A2*	5.275 *A2*		6.45 *A2*	
	Harrisburg, Pa.							3.85 *C3*	5.15 *C3*			
	Hartford, Conn.			5.90 *R3*		6.925 *R3*						
	Johnstown, Pa.	4.30 *B3*	4.30 *B3*		5.075 *B3*		6.45 *B3*	4.225 *B3*		5.80 *B3*	6.45 *B3*	5.75 *B3*
	Fairless, Pa.	4.45 *U1*	4.45 *U1*		5.225 *U1*							
	Newark, N. J.			5.85 *W10*		6.80 *W10*						
	Camden, N. J.			5.85 *P10*								
	Putnam, Conn.			5.95 *W10*								
	Sparrows Pt., Md.		4.30 *B3*					4.225 *B3*		5.80 *B3*	6.45 *B3*	5.85 *B3*
	Palmer, Worcester, Mansfield, Mass.			5.95 *B5*		6.925 *A5* 7.075 *B5*						6.05 *A5, W6*
MIDDLE WEST	Alton, Ill.	4.50 *L1*										5.925 *L1*
	Ashland, Newport, Ky.							4.225 *A7, N5*		5.80 *N5*		
	Canton-Massillon, Mansfield, Ohio			5.40 *R2* 5.44 *R3*	4.875 *T5* 5.115 *R3*	6.325 *T5* 6.625 *R2* 6.665 *R3*		4.225 *E2*				
	Chicago, Joliet, Ill.	4.30 *U1, N4,W8* 4.37 *R3*	4.30 *N4* 4.37 *R3*	5.40 *A5,W10, W8,B5,L2*	5.075 *U1, W8* 5.145 *R3*	6.625 *A5,W8, W10,L2, B5*		4.225 *U1,W8, I3, A1*	5.275 *U1*	5.80 *U1*	6.45 *U1*	5.75 *A5, R3,N4, W7*
	Cleveland, Ohio	4.36 *R3*	4.36 *R3*	5.40 *A5,C13*		6.625 *A5* 6.665 *C13*		4.225 *J3* 4.285 *R3*	5.275 *J3*		6.45 *J3*	5.75 *A5, C13*
	Detroit, Mich.	4.45 *R5,G3*		5.55 *R5* 5.60 *B5,P8* 5.65 *P3*	5.175 *R5* 5.225 *G3*	6.725 *R5* 6.825 *B5,P3, P8*	6.60 *G3*	4.375 *G3*			6.60 *G3*	
	Duluth, Minn.											5.75 *A5*
	Gary, Ind. Harbor, Crawfordsville	4.30 *I3, U1, Y1*	4.30 *I3, U1, Y1*	5.40 *M5* 5.47 *R3*	5.075 *I3, U1, Y1*	6.525 *M5* 6.695 *R3*	6.45 *U1,I3, Y1*	4.225 *I3, U1,Y1*	5.275 *I3*	5.80 *U1*	6.45 *U1,I3, Y1*	5.85 *M4*
	Granite City, Ill.							4.425 *G2*				
	Kokomo, Ind.											5.85 *C9*
	Sterling, Ill.	4.40 *N4*	4.40 *N4*									5.85 *N4*
	Niles, Ohio Sharon, Pa.	4.34 *R3*						4.225 *S1*		5.80 *S1*	6.45 *S1*	
	Pittsburgh, Pa. Midland, Pa.	4.30 *J3, U1, C11*	4.30 *J3, U1*	5.40 *A5,C8,C11 J3,W10,B4* 5.46 *R3*	5.075 *U1,C11,*	6.625 *A5,C11, W10,C8* 6.685 *R3*	6.45 *J3, U1*	4.225 *J3, U1*	5.275 *U1*	5.80 *U1*	6.45 *J3, U1*	5.75 *A5,J3, P6*
	Portsmouth, Ohio											5.75 *P7*
	Weirton, Wheeling, Follansbee, W. Va.	4.30 *W3*						4.225 *W3, W5*				
	Youngstown, Ohio	4.30 *U1 Y1 C10* 4.35 *R3*	4.30 *U1, Y1* 4.35 *R3*	5.40 *F2, Y1, C10*	5.075 *U1, Y1, C10*	6.625 *Y1, C10* 6.665 *F2*	6.45 *U1, Y1*	4.225 *U1, Y1*		5.80 *Y1*	6.45 *Y1*	5.75 *Y1*
WEST	Emeryville, Cal.	5.05 *J5*	5.05 *J5*									
	Fontana, Cal.	5.00 *K1*	5.00 *K1*		6.125 *K1*		7.70 *K1*	4.875 *K1*		6.85 *K1*	7.15 *K1*	
	Geneva, Utah							4.225 *C7*			6.45 *C7*	
	Kansas City, Mo.	4.90 *S2*	4.90 *S2*		5.675 *S2*		7.05 *S2*					6.35 *S2*
	Los Angeles, Torrance, Cal.	5.00 *B2,C7*	5.00 *B2,C7*	6.85 *R3* 7.16 *R3*	6.125 *B2*		7.15 *B2*					6.70 *B2*
	Minnequa, Colo.	4.75 *C6*	4.75 *C6*					5.075 *C6*				5.90 *C6*
	Portland, Ore.	4.90 *O2*										
	San Francisco, Niles, Pittsburg, Cal.	5.00 *C7,P9* 5.05 *B2*	5.00 *C7,P9* 5.05 *B2*				7.20 *B2*					6.70 *C7*
	Seattle, Wash.	5.05 *B2, P12, N6*	5.05 *B2, P12*				7.20 *B2*	5.125 *B2*		6.70 *B2*	7.35 *B2*	
SOUTH	Atlanta, Ga.	4.50 *A8*	4.50 *A8*									5.95 *A8*
	Fairfield, Ala. City, Birmingham, Ala.	4.30 *T2,C16* 4.33 *R3*	4.30 *T2, C16* 4.33 *R3*				6.45 *T2*	4.225 *T2* 4.255 *R3*			6.45 *T2*	5.75 *R3, T2*
	Houston, Ft. Worth, Lone Star, Tex.	4.70 *S2*	4.70 *S2*		5.475 *S2*		6.85 *S2*	4.625 *S2*		6.20 *S2*	6.85 *S2*	6.25 *S2*

Steel Prices

(Effective July 27, 1954)

Key to Steel Producers

With Principal Offices

A1 Acme Steel Co., Chicago
A2 Alan Wood Steel Co., Conshohocken, Pa.
A3 Allegheny Ludlum Steel Corp., Pittsburgh
A4 American Cladmetals Co., Carnegie, Pa.
A5 American Steel & Wire Div., Cleveland
A6 Angell Nail & Chaplet Co., Cleveland
A7 Armco Steel Corp., Middletown, O.
A8 Atlantic Steel Co., Atlanta, Ga.

B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2 Bethlehem Pacific Coast Steel Corp., San Francisco
B3 Bethlehem Steel Co., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin, Inc., Harvey, Ill.

C1 Calstrip Steel Corp., Los Angeles
C2 Carpenter Steel Co., Reading, Pa.
C3 Central Iron & Steel Co., Harrisburg, Pa.
C4 Claymont Products Dept., Claymont, Del.
C5 Cold Metal Products Co., Youngstown, O.
C6 Colorado Fuel & Iron Corp., Denver
C7 Columbia Geneva Steel Div., San Francisco
C8 Columbia Steel & Shafting Co., Pittsburgh
C9 Continental Steel Corp., Kokomo, Ind.
C10 Copperweld Steel Co., Pittsburgh, Pa.
C11 Crucible Steel Co. of America, New York
C12 Cumberland Steel Co., Cumberland, Md.
C13 Cuyahoga Steel & Wire Co., Cleveland
C14 Compressed Steel Shafting Co., Readville, Mass.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Div., Birmingham

D1 Detroit Steel Corp., Detroit
D2 Detroit Tube & Steel Div., Detroit
D3 Driver Harris Co., Harrison, N. J.
D4 Dickson Weatherproof Nail Co., Evanston, Ill.

E1 Eastern Stainless Steel Corp., Baltimore
E2 Empire Steel Co., Mansfield, O.

F1 Firth Sterling, Inc., McKeesport, Pa.
F2 Fitzsimmons Steel Corp., Youngstown
F3 Follansbee Steel Corp., Follansbee, W. Va.

G1 Globe Iron Co., Jackson, O.
G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Corp., Detroit
G4 Greer Steel Co., Dover, O.

H1 Hanna Furnace Corp., Detroit

I2 Ingersoll Steel Div., Chicago
I3 Inland Steel Co., Chicago
I4 Interlake Iron Corp., Cleveland

J1 Jackson Iron & Steel Co., Jackson, O.
J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Cal.
K2 Keystone Steel & Wire Co., Peoria
K3 Koppers Co., Granite City, Ill.

L1 Laclede Steel Co., St. Louis
L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.

M1 Mahoning Valley Steel Co., Niles, O.
M2 McLouth Steel Corp., Detroit
M3 Mercer Tube & Mfg. Co., Sharon, Pa.
M4 Mid-States Steel & Wire Co., Crawfordsville, Ind.
M5 Monarch Steel Co., Inc., Hammond, Ind.
M6 Mystic Iron Works, Everett, Mass.

N1 National Supply Co., Pittsburgh
N2 National Tube Div., Pittsburgh
N3 Niles Rolling Mill Div., Niles, O.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N5 Newport Steel Corp., Newport, Ky.
N6 Northwest Steel Rolling Mills, Seattle
N7 Newman Crosby Steel Co., Pawtucket, R. I.

O1 Oliver Iron & Steel Co., Pittsburgh
O2 Oregon Steel Mills, Portland

P1 Page Steel & Wire Div., Monessen, Pa.
P2 Phoenix Iron & Steel Co., Phoenixville, Pa.
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.
P4 Pittsburgh Coke & Chemical Co., Pittsburgh
P5 Pittsburgh Screw & Bolt Co., Pittsburgh
P6 Pittsburgh Steel Co., Pittsburgh
P7 Portsmouth Div., Detroit Steel Corp., Detroit
P8 Plymouth Steel Co., Detroit
P9 Pacific States Steel Co., Niles, Cal.
P10 Precision Drawn Steel Co., Camden, N. J.
P11 Production Steel Strip Corp., Detroit
P12 Pacific Steel Rolling Mills, Seattle

R1 Reeves Steel & Mfg. Co., Dover, O.
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.
R3 Republic Steel Corp., Cleveland
R4 Roebling Sons Co., John A., Trenton, N. J.
R5 Rotary Electric Steel Co., Detroit
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.
S2 Sheffield Steel Corp., Kansas City
S3 Shenango Furnace Co., Pittsburgh
S4 Simonds Saw & Steel Co., Fitchburg, Mass.
S5 Sweet's Steel Co., Williamsport, Pa.
S6 Standard Forging Corp., Chicago
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S9 Superior Steel Corp., Carnegie, Pa.

T1 Tonawanda Iron Div., N. Tonawanda, N. Y
T2 Tennessee Coal & Iron Div., Fairfield
T3 Tennessee Products & Chem. Corp., Nashville
T4 Thomas Strip Div., Warren, O.
T5 Timken Steel & Tube Div., Canton, O.
T6 Tremont Nail Co., Wareham, Mass.
T7 Texas Steel Co., Fort Worth

U1 United States Steel Corp., Pittsburgh
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.
U3 Fred Ulbrich & Sons, Wallingford, Conn.
U4 U. S. Pipe & Foundry Co., Birmingham

W1 Wallingford Steel Co., Wallingford, Conn.
W2 Washington Steel Corp., Washington, Pa.
W3 Weirton Steel Co., Weirton, W. Va.
W4 Wheatland Tube Co., Wheatland, Pa.
W5 Wheeling Steel Corp., Wheeling, W. Va.
W6 Wickwire Spencer Steel Div., Buffalo
W7 Wilson Steel & Wire Co., Chicago
W8 Wisconsin Steel Co., S. Chicago, Ill.
W9 Woodward Iron Co., Woodward, Ala.
W10 Wycoff Steel Co., Pittsburgh
W11 Worcester Pressed Steel Co., Worcester, Mass.

Y1 Youngstown Sheet & Tube Co., Youngstown

PIPE AND TUBING

Base discounts (pct) f.o.b. mills. Base price about $200 per net ton.

	BUTTWELD														SEAMLESS							
	½ In.		¾ In.		1 In.		1¼ In.		1½ In.		2 In.		2½–3 In.		2 In.		2½ In.		3 In.		3½–4 In.	
	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.
STANDARD T. & C.																						
Sparrows Pt. B3	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown R3	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fontana K1	10.75	+4.5	13.75	+0.5	16.25	3.0	18.75	3.75	19.25	4.75	19.75	5.25	21.25	5.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh J3	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Alton, Ill. L1	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Sharon M3	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fairless N2	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh N1	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Wheeling W5	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland W4	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown Y1	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Indiana Harbor Y1	22.75	7.5	25.75	11.5	28.25	15.0	30.75	15.75	31.25	16.75	31.75	17.25	33.25	17.0	.....	.....	.....	.....	.....	.....	.....	.....
Lorain N2	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
EXTRA STRONG PLAIN ENDS																						
Sparrows Pt. B3	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.75	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown R3	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.25	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Fairless N2	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.75	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fontana K1	14.25	.....	18.25	.....	20.25	.....	20.75	.....	21.25	.....	21.75	.....	22.25	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh J3	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.25	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Alton, Ill. L1	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.25	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Sharon M3	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh N1	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Wheeling W5	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland, W4	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown Y1	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Indiana Harbor Y1	26.25	12.5	30.25	16.5	32.25	20.0	32.75	18.75	33.25	19.75	33.75	20.75	34.25	19.0	.....	.....	.....	.....	.....	.....	.....	.....
Lorain N2	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75

Threads only, buttweld and seamless 2¼ pt. higher discount. Plain ends, buttweld and seamless, 3-in. and under, 4½ pt. higher discount. Buttweld jobbers' discount, 5 pct.

Galvanized discounts based on zinc price in range of over 9¢ to 11¢ incl. per lb, East St. Louis. For each 2¢ change in zinc, discounts vary as follows: ½, ¾ and 1-in., 2 pt.; 1¼, 1½ and 2-in., 1½ pt.; 2½ and 3-in., 1 pt. e.g., zinc price in range of over 11¢ to 13¢ would lower discounts; zinc price in range of over 7¢ to 9¢ would increase discounts. East St. Louis zinc price now 11.00¢ per lb.

Steel Prices

(Effective July 27, 1954)

To identify producers, see Key on preceding page

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Screw Spikes	Tie Plates	Track Bolts Treated
Bessemer *U1*	4.45	5.35	5.425	.....	.....	.....	.....
So. Chicago *R3*	.....	.....	.....	7.30	.....	.....	.....
Ensley *T2*	4.45	5.35	.....	.....	.....	.....	.....
Fairfield *T2*	.....	5.35	.....	7.30	.....	5.275	.....
Gary *U1*	4.45	5.35	.....	.....	.....	5.275	.....
Ind. Harbor *I3*	4.45	.....	5.425	7.30	.....	5.275	.....
Johnstown *B3*	.....	5.35	.....	.....	.....	.....	.....
Joliet *U1*	.....	5.35	5.425	.....	.....	.....	.....
Kansas City *S2*	.....	.....	.....	7.30	.....	.....	11.00
Lackawanna *B3*	4.45	5.35	5.425	.....	.....	5.275	.....
Minnequa *C6*	4.45	5.88	5.425	7.30	.....	5.275	11.00
Pittsburgh *O1*	.....	.....	.....	.....	11.00	.....	11.50
Pittsburgh *P5*	.....	.....	.....	.....	11.00	.....	11.50
Pittsburgh *J3*	.....	.....	.....	7.30	.....	.....	.....
Seattle *B2*	.....	.....	.....	7.80	.....	5.425	11.50
Steelton *B3*	4.45	.....	5.425	.....	.....	5.275	.....
Struthers *Y1*	.....	.....	.....	7.30	.....	.....	.....
Torrance *C7*	.....	.....	.....	.....	.....	5.425	.....
Williamsport *S5*	.....	5.35	.....	.....	.....	.....	.....
Youngstown *R3*	.....	.....	.....	7.30	.....	.....	.....

ELECTRICAL SHEETS

22-Gage F.o.b. Mill Cents Per Lb	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length) Semi-Processed	Fully Processed
Field	8.025	8.225	....
Armature	8.50	8.75	9.25
Elect.	9.10	9.35	9.85
Motor	10.10	10.35	10.85
Dynamo	11.00	11.25	11.75
Trans. 72	11.95	12.20	12.70
Trans. 65	12.50	Grain Oriented	
Trans. 58	13.00	Trans. 80	16.60
Trans. 52	14.00	Trans. 73	17.10

Producing points: Beech Bottom (*W5*); Brackenridge (*A5*); Granite City (*G2*); Indiana Harbor (*I3*); Mansfield (*E2*); Newport, Ky. (*N5*); Niles, O. (*N3*); Vandergrift (*U1*); Warren, O. (*R3*); Zanesville (*A7*).

* Coils 75¢ higher.

CLAD STEEL

	Plate	Sheet
Stainless-carbon		
No. 304, 20 pct.		
Coatesville, Pa., *L4*	*32.7	
Washington, Pa., *J2*	....	
Claymont, Del., *C4*	....	
New Castle, Ind., *I2*	....	32.50
Nickel-carbon		
10 pct. Coatesville, Pa., *L4*	37.5	
Inconel-carbon		
10 pct., Coatesville, Pa., *L4*	46.10	
Monel-carbon		
10 pct. Coatesville, Pa., *L4*	38.90	

* Includes annealing and pickling, sandblasting.

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails Col	Woven Wire Fence 9–15½ ga. Col	"T" Fence Posts Col	Single Loop Bale Ties Col	Galv. Barbed and Twisted Barbless Wire Col	Merch. Wire Ann'ld ¢/lb.	Merch. Wire* Galv. ¢/lb.
Alabama City *R3*	137	146	...	155	159	6.90	7.30
Aliquippa, Pa. *J3*	137	149	...	...	156	6.90	7.425
Atlanta *A8*	139	151	...	157	164	7.00	7.525
Bartonville *K2*	139	151	...	157	164	7.00	7.55
Buffalo *W6*	...	...	...	...	...	6.90	7.30
Chicago, Ill. *N4*	137	149	...	155	162	6.90	7.45
Cleveland *A6*	142	...	...	...	...	...	...
Cleveland *A5*	...	...	...	...	...	6.90	...
Crawfordsville *M4*	139	151	...	157	159	7.00	7.55
Donora, Pa. *A5*	137	146	...	155	159	6.90	7.30
Duluth *A5*	137	146	150	155	159	6.90	7.30
Fairfield, Ala. *T2*	137	146	...	155	159	6.90	7.30
Galveston *D4*	139	...	...	...	...	...	...
Houston *S2*	145	154	...	...	167	7.30	7.70
Johnstown, Pa. *B3*	137	149	...	...	162	6.90	7.45
Joliet, Ill. *A5*	137	146	...	155	159	6.90	7.30
Kokomo, Ind. *C9*	139	148	...	157	161	7.00	7.35
Los Angeles *B2*	...	...	...	...	...	7.85	...
Kansas City *S2*	148	158	...	167	171	7.50	7.90
Minnequa *C6*	142	156	150	160	168	7.15	7.55
Monessen *P6*	137	151	...	...	163	6.90	7.45
Moline, Ill. *R3*	...	...	145	...	...	...	...
Pittsburg, Cal. *C7*	156	169	...	179	179	7.85	8.25
Portsmouth *P7*	...	...	...	...	...	6.90	7.90
Rankin, Pa. *A5*	137	146	...	...	159	6.90	7.30
So. Chicago *R3*	137	146	145	155	159	6.90	7.30
S. San Francisco *C6*	...	...	...	...	179	...	...
Sparrows Pt. *B3*	139	...	...	157	164	7.00	7.55
Struthers, O. *Y1*	...	...	...	...	...	6.90	7.35
Worcester *A5*	143	...	...	...	...	7.29	...
Williamsport, Pa. *S5*	...	...	150	...	...	...	...

Cut Nails, carloads, base $8.30 per keg at Conshohocken, Pa. (*A2*).

* Alabama City and So. Chicago don't include zinc extra. Galvanized products computed with zinc at 11.0¢ per lb.

WAREHOUSES

Base price, f.o.b., dollars per 100 lb.

Cities	City Delivery Charge	Sheets: Hot-Rolled	Sheets: Cold-Rolled (15 gage)	Sheets: Galvanized (10 gage)	Strip: Hot-Rolled	Strip: Cold-Rolled	Plates	Shapes: Standard Structural	Bars: Hot-Rolled	Alloy Bars: Cold-Finished	Alloy Bars: Hot-Rolled A 4615 As Rolled	Alloy Bars: Hot-Rolled A 4140 Annealed	Alloy Bars: Cold-Drawn A 4615 As Rolled	Alloy Bars: Cold-Drawn A 4140 Annealed
Baltimore	$.20	6.22	7.51	7.78	6.89	.....	6.57	6.92	6.88	8.52	.....	.....	.....	.....
Birmingham	.15	6.35–6.50	7.35–8.10	8.25–9.00	6.60	9.60	6.65	6.65	6.50	9.00	.....	.....	.....	.....
Boston	.10	7.23	8.23	9.42–9.52	7.47	9.65–9.85	7.34–7.37	7.49	7.20	8.60–8.70	12.60–12.80	12.45–12.46	15.15	15.10
Buffalo	.20	6.35–6.40	7.40–7.45	8.80–8.84	6.70–6.75	.....	6.65–6.70	6.78–6.77	6.50–6.55	7.85–7.90	12.50	12.15	14.85	14.30–14.80
Chicago	.20	6.38	7.38	8.30	6.62	.....	6.52	6.69	6.51	7.50	12.25	11.90	14.60	14.55
Cincinnati	.15	6.49–6.53	7.37–7.42	8.25–8.30	6.86–6.91	.....	6.81–6.86	6.91	6.75–6.80	7.80–7.85	12.55	12.15–12.20	14.90	14.80–14.85
Cleveland	.20	6.38	7.38	8.45	6.72	.....	6.69	7.02	6.57	7.60	11.96	.....	.....	14.61
Denver	.....	7.85	8.85	10.02	8.20	.....	7.95	7.95	8.05	9.05	.....	.....	.....	.....
Detroit	.20	6.57	7.57	8.50–8.58	8.90	.....	6.80–6.85	7.16	6.79	7.77	12.45	12.10	14.80	14.75
Houston	.20	7.35	7.65–7.80	9.93	7.70	.....	7.35	7.60	7.70	9.50–9.60	.....	13.10	.....	.....
Kansas City	.20	7.05	8.05	8.95	7.29	.....	7.19	7.36	7.18	8.07	.....	12.27	.....	.....
Los Angeles	.20	7.40	9.25	9.55–9.85	7.75	.....	7.35	7.55	7.35–7.45	10.05	.....	13.20	.....	16.35
Memphis	.10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Milwaukee	.20	6.47	7.47	8.21–8.39	6.71	.....	6.61	6.86	6.60	7.69	12.34	11.99	14.69	14.64–14.84
New Orleans	.15	6.70	7.65	.....	6.80	.....	6.90	7.05	6.80	8.70	.....	.....	.....	.....
New York	.10	6.97–6.98	7.78–8.46	8.79[1]–8.99	7.36–7.56	.....	7.18–7.27	7.13–7.38	7.30–7.37	8.63–8.73[2]	12.63	12.28	.....	14.93
Norfolk	.20	7.00	.....	.....	7.10	.....	7.10	7.10	7.10	8.60	.....	.....	.....	.....
Philadelphia	.25	6.19	7.29–7.84	8.09–8.23	6.96	.....	6.49	6.54	6.74	8.19	.....	11.66–11.96	.....	14.61
Pittsburgh	.20	6.38	7.38	8.30–8.50	6.72–6.75	.....	6.52	6.69	6.51	7.85	12.25	11.90	14.60	14.55
Portland	.20	7.60	8.75	9.05	7.85	.....	7.45	7.50	7.55	10.95	.....	.....	.....	.....
Salt Lake City	.20	7.65	10.20	10.70	9.05	.....	7.70	7.70–8.85	8.80	10.95	.....	.....	.....	.....
San Francisco	.15	7.55	8.95	9.35–9.85	7.80	.....	7.40	7.50	7.35	10.05	.....	13.20	.....	16.35
Seattle	.20	8.10	9.80	10.15	8.20	.....	7.80	7.75	7.80	10.95	.....	13.65	.....	16.30
St. Louis	.20	6.62–6.67	7.67	8.54–8.59	6.91	.....	6.81	7.09	6.80	7.89	12.54	12.19	14.84–14.89	14.45–14.84
St. Paul	.15	7.03	8.03–8.58	8.96	7.28	.....	7.19	7.35	7.16	8.26	.....	12.56	.....	15.21

Base Quantities (Standard unless otherwise keyed): Cold finished bars; 2000 lb or over. Alloy bars; 1000 to 1999 lb. All others; 2000 to 9999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may not be combined with each other or with galvanized sheets, for quantity.

Exceptions: (1)1500 to 9999 lb. (2)1000 lb or over.

C-R SPRING STEEL

Cents Per Lb F.o.b. Mill	CARBON CONTENT 0.26–0.40	0.41–0.60	0.61–0.80	0.81–1.05	1.06–1.35
Bridgeport, Conn. *S7**	5.75	8.05	9.00	11.15	13.85
Buffalo, N. Y. *R7*	5.75	8.05	9.00	10.95	13.25
Carnegie, Pa. *S9*	.....	8.05	9.00	11.15	13.85
Cleveland *A5*	5.75	8.05	9.00	11.15	13.85
Detroit *D1*	5.90	8.25	9.20	10.95	.....
Detroit *D2*	5.90	8.25	9.20	.....	.....
Harrison, N. J. *C11*	.....	.....	9.30	11.45	14.15
Indianapolis *C5*	5.75	8.05	9.00	10.95	.....
New Castle, Pa. *B4*	5.75	8.05	9.00	10.95	.....
New Haven, Conn. *D1*	6.20	8.35	9.30	11.25	.....
Pawtucket, R. I. *N7*	6.30	8.35	9.30	11.45	14.15
Riverdale, Ill. *A1*	5.85	8.05	9.00	11.15	13.85
Sharon, Pa. *S1*	5.75	8.05	9.00	10.95	13.25
Trenton *R4*	.....	8.35	9.30	11.25	13.40
Wallingford *W1*	6.20	8.35	9.30	11.25	13.55
Warren, Ohio *T4*	5.75	8.05	9.00	10.95	13.25
Weirton, W. Va. *W3*	5.85	8.05	9.00	10.95	13.25
Worcester, Mass. *A5*	6.60	8.35	9.30	11.45	14.15
Youngstown *C5*	5.75	8.05	9.00	10.95	.....

* Sold on Pittsburgh base.

BOILER TUBES

$ per 100 ft. carload lots, cut 10 to 24 ft. F.o.b. Mill	Size OD-In.	Size B.W. Ga.	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.	Elec. Weld C.D.
Babcock & Wilcox	2	13	28.33	33.97	26.51	31.81
	2½	12	38.15	45.74	35.70	43.67
	3	12	44.05	52.82	41.23	49.73
	3½	11	51.43	61.66	48.13	58.86
	4	10	68.29	81.28	63.92	77.10
National Tube	2	13	28.33	33.97	26.51	.....
	2½	12	38.15	45.74	35.70	.....
	3	12	44.05	52.82	41.23	.....
	3½	11	51.43	61.66	48.13	.....
	4	10	68.29	81.28	63.92	.....
Pittsburgh Steel	2	13	28.33	33.97	.....	.....
	2½	12	38.15	45.74	.....	.....
	3	12	44.05	52.82	.....	.....
	3½	11	51.43	61.66	.....	.....
	4	10	68.29	81.25	.....	.....

Miscellaneous Prices

(Effective July 27, 1954)

TOOL STEEL

F.o.b. Mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	—	$1.54
18	4	1	—	5	2.185
18	4	2	—	—	1.705
18	4	1.5	8	—	.90
1.5	4	2	6	—	1.29
6	4				.73

High-carbon chromium ..... .73
Oil hardened manganese ..... .405
Special carbon ..... .37
Extra carbon ..... .31
Regular carbon ..... .26

Warehouse prices on and east of Mississippi are 3.5¢ per lb higher. West of Mississippi, 6.5¢ higher.

CAST IRON WATER PIPE

	Per Net Ton
4 to 24-in., del'd Chicago	$111.80 to $115.30
4 to 24-in., del'd N. Y.	115.00 to 116.00
4 to 24-in., Birmingham	98.00 to 102.50

6-in. and larger f.o.b. cars, San Francisco, Los Angeles, for all rail shipments; rail and water shipments less ..... $129.50 to $131.50

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

LAKE SUPERIOR ORES

51.50% Fe; natural content, delivered lower Lake ports. Prices effective July 1, 1953, to end of 1954 season.

	Gross Ton
Openhearth lump	$11.15
Old range, bessemer	10.30
Old range, nonbessemer	10.15
Mesabi, bessemer	10.05
Mesabi, nonbessemer	9.90
High phosphorus	9.90

Prices based on upper Lakes rail freight rates, Lake vessel freight rates, handling and unloading charges, and taxes thereon, in effect on June 24, 1953. Increases or decreases after such date are for buyer's account.

COKE

Furnace, beehive (f.o.b. oven) Connellsville, Pa.	Net-Ton $14.25 to $14.50
Foundry, beehive (f.o.b. oven) Connellsville, Pa.	$16.50 to $17.00
Foundry, oven coke	
Buffalo, del'd	$28.08
Chicago, f.o.b.	24.50
Detroit, f.o.b.	25.50
New England, del'd	26.05
Seaboard, N. J., f.o.b.	24.00
Philadelphia, f.o.b.	23.00
Swedeland, Pa., f.o.b.	23.85
Painesville, Ohio, f.o.b.	24.00
Erie, Pa., f.o.b.	25.00
Cleveland, del'd	27.42
Cincinnati, del'd	26.56
St. Paul, f.o.b.	23.75
St. Louis, f.o.b.	24.00
Birmingham, f.o.b.	22.65
Lone Star, Tex., f.o.b.	18.50

ELECTRODES

Cents per lb, f.o.b. plant, threaded, with nipples, unboxed

GRAPHITE			CARBON		
Diam. (in.)	Length (in.)	Price	Diam. (in.)	Length (in.)	Price
24	84	20.50	40	100, 110	8.95
20	72	20.00	35	110	8.95
16 to 18	72	20.50	30	110	8.95
14 to 16	60	21.00	24	72 to 84	9.10
8	60	23.25	20	90	9.95
6	48	26.00	17	72	9.10
3	40	27.25	14	72	9.50
2½	30	28.00	10, 12	60	10.30
2	24	43.50	8	60	10.55

BOLTS, NUTS, RIVETS, SCREWS

Consumer Prices

(Base, discount, f.o.b. mill, Pittsburgh, Cleveland, Birmingham or Chicago)

Nuts, Hot Pressed, Cold Punched—Sq.

Pct Off List

	Less Keg Reg.	K.	Less Keg Hvy.	K.
½ in. & smaller	+2	15	+2	18
9/16 in. & ⅝ in.	+7	11	+32*	+10*
¾ in. to 1½ in. inclusive	+8	10	+27**	+6**
1⅝ in. & larger	+9	9	+27	+6

* 9/16 to ¾ in.
** ⅞ to 1½ in.

Nuts, Hot Pressed—Hexagon

½ in. & smaller	11	26	8	23
9/16 in. & ⅝ in.	2	18	+20	net
¾ in. to 1½ in. inclusive	+6	12	+25	+4
1⅝ in. & larger	+8	10	+25	+4

Nuts, Cold Punched—Hexagon

½ in. & smaller	11	26	8	23
9/16 in. & ⅝ in.	9	24	+2	15
¾ in. to 1½ in. inclusive	+1	16	+9	9
1⅝ in. & larger	+16	3	+20	net

Nuts, Semi-Finished—Hexagon

½ in. & smaller	23	36	14	28
9/16 in. & ⅝ in.	18	32	4	20
¾ in. to 1½ in. inclusive	8	23	+8	10
1⅝ in. & larger	+14	5	+20	net
	Light			
7/16 in. & smaller	33	43		
½ in. thru ⅝ in.	26	37		
¾ in. to 1½ in. inclusive	18	30		

Stove Bolts *Pct Off List*

Packaged, steel, plain finished 44½—10
Packaged, plain finish ..... 25½—10
Bulk, plain finish** 59*

* Discounts apply to bulk shipments in not less than 15,000 pieces of a size and kind where length is 3-in. and shorter; 5000 pieces for lengths longer than 3-in. For lesser quantities, packaged price applies.

**Zinc, Parkerized, cadmium or nickel plated finishes add 6¢ per lb net. For black oil finish, add 2¢ per lb net.

Rivets *Base per 100 lb*

½ in. & larger $8.90

Pct Off List

7/16 in. and smaller 30

Cap and Set Screws

(In bulk) *Pct Off List*

Hexagon head cap screws, coarse or fine thread, ¼ in. thru ⅝ in. x 6 in., SAE 1020, bright 40
¾ in. thru 1 in. up to & including 6 in. 26
¼ in. thru ⅝ in. x 6 in. & shorter high C double heat treat 43
⅞ in. thru 1 in. up to & including 6 in. 33
Milled studs 17
Flat head cap screws, listed sizes ... 12
Fillister head cap, listed sizes 7
Set screws, sq head, cup point, 1 in. diam. and smaller x 6 in. & shorter 37

Machine and Carriage Bolts

Pct Off List

	Less Case	C.
½ in. & smaller x 6 in. & shorter	4	20
9/16 in. & ⅝ in. x 6 in. & shorter	5	21
⅞ in. & larger x 6 in. & shorter	3	19
All diam. longer than 6 in.	+4	13
Lag, all diam. x 6 in. & shorter	12	27
Lag, all diam. longer than 6 in.	8	23
Plow bolts	30	..

REFRACTORIES

Fire Clay Brick *Carloads per 1000*

First quality, Ill., Ky., Md., Mo., Ohio, Pa. (except Salina, Pa., add $5.00) $109.00
No. 1 Ohio 102.00
Sec. quality, Pa., Md., Ky., Mo., Ill. 102.00
No. 2 Ohio 93.00
Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50) 16.00

Silica Brick

Mt. Union, Pa., Ensley, Ala. $115.00
Childs, Hays, Pa. 120.00
Chicago District 125.00
Western Utah 131.00
California 138.00
Super Duty Hays, Pa., Athens, Tex., Windham 132.00
Curtner, Calif. 150.00
Silica cement, net ton, bulk, Eastern (except Hays, Pa.) 19.00
Silica cement, net ton, bulk, Hays, Pa. 21.00
Silica cement, net ton, bulk, Chicago District, Ensley, Ala. 20.00
Silica cement, net ton, bulk, Utah and Calif. 28.50

Chrome Brick *Per net ton*

Standard chemically bonded Balt. $86.00
Standard chemically bonded, Curtner, Calif. 96.25
Burned, Balt. 80.00

Magnesite Brick

Standard Baltimore $109.00
Chemically bonded, Baltimore 97.50

Grain Magnesite *St. ⅝-in. grains*

Domestic, f.o.b. Baltimore in bulk fines removed $64.40
Domestic, f.o.b. Chewalah, Wash., Luning, Nev.
in bulk 38.00
in sacks 43.75

Dead Burned Dolomite *Per net ton*

F.o.b. bulk, producing points in:
Pa., W. Va., Ohio $14.50
Midwest 14.60
Missouri Valley 13.65

FLUORSPAR

Washed gravel, f.o.b. Rosiclaire, Ill.
Price, net ton; Effective CaF_2 content
72½% $44.00
70% or more 42.50
60% or less 38.00

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron c.i.f. New York, ocean bags ... 11.25¢
Canadian sponge iron,
Del'd in East .. ... 12.0¢
F.o.b. ship. pt., carloads... 9.5¢
Domestic sponge iron, 98+% Fe, carload lots ..... 18.0¢
Electrolytic iron, annealed, 99.5+% Fe ..... 38.0¢
Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe 53.5¢
Hydrogen reduced iron minus 300 mesh, 98+% Fe..63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 micron, 98%, 99.8+% Fe..83.0¢ to $1.48
Aluminum ..... 31.5¢
Brass, 10 ton lots .....29.50¢ to 36.50¢
Copper, electrolytic ..... 43.50¢
Copper, reduced ..... 43.50¢
Cadmium, 100-199 lb 95¢ plus metal value
Chromium, electrolytic, 99% min., and quality, del'd... $3.60
Lead ..... 21.00¢
Manganese ..... 57.0¢
Molybdenum, 99% $2.75
Nickel, unannealed ..... 89.50¢
Nickel, annealed ..... 96.50¢
Nickel, spherical, unannealed 93.50¢
Silicon ..... 43.50¢
Solder powder..7.0¢ to 9.0¢ plus met. value
Stainless steel, 302 ..... 91.0¢
Stainless steel, 316 ..... $1.10
Tin .....14.04¢ plus metal value
Tungsten, 99% (65 mesh) .. $4.65
Zinc, 10 ton lots .....17.5¢ to 25.0¢

Ferroalloy Prices

(Effective July 27, 1954)

Ferrochrome

Contract prices, cents per lb contained Cr, lump size, bulk, in carloads, delivered.

65-72 Cr, 2% max. Si.

0.025% C	34.50	0.20% C	33.50
0.06% C	34.50	0.50% C	33.25
0.10% C	34.00	1.00% C	33.00
0.15% C	33.75	2.00% C	32.75

65-69% Cr, 4.9% C 24.75

62-66% Cr, 4.6% C, 6-9% Si 35.60

S. M. Ferrochrome

Contract prices, cents per pound, chromium contained, lump size, delivered.

High carbon type: 60.65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads	25.85
Ton lots	28.00
Less ton lots	29.50

Ferromanganese

Maximum contract base price, f.o.b., lump size, base content 74 to 76 pct Mn:

Producing Point	Cents per-lb
Marietta, Ashtabula, O.; Alloy, W. Va.; Sheffield, Ala.; Portland, Ore.	10.00
Clairton, Pa.	10.00
Sheridan, Pa.	10.00
Philo, Ohio	10.00

Add or subtract 0.1¢ for each 1 pct Mn above or below base content.

Briquets, delivered, 66 pct Mn:

Carloads, bulk	12.50
Ton lots packed	14.05

High-Nitrogen Ferrochrome

Low-carbon type 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 3¢ for each additional 0.25% of N.

Spiegeleisen

Contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

Manganese	Silicon	
16 to 19%	3% max.	$84.00
19 to 21%	3% max.	86.00
21 to 23%	3% max.	88.50
23 to 25%	3% max.	91.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.

95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.

Carload, packed	36.50
Ton lots	38.00

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	34.00
Ton lots	35.00
250 to 1999 lb	36.00
Less than 250 lb	37.00
Premium for hydrogen-removed metal	0.75

Medium Carbon Ferromanganese

Mn 80% to 85%, C 1.25 to 1.50. Contract price, carloads, lump, bulk, delivered, per lb of contained Mn 21.50

Low-Carb Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd Mn 85-90%.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	30.00	31.85	33.00
0.07% max. C	27.95	29.80	31.00
0.15% max. C	27.45	29.30	30.50
0.30% max. C	26.95	28.30	30.00
0.50% max. C	26.45	28.30	29.50
0.75% max. C, 80-85% Mn, 5.0-7.0% Si	23.45	25.30	26.50

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C for 3% max. C deduct 0.2¢.

Carload bulk	11.00
Ton lots	12.60
Briquet contract basis carlots, bulk, delivered, per lb of briquet	12.00
Ton lots, packed	14.10

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $92.00 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $89.50. Add $1.00 per ton for each additional 0.50% Si up to and including 17%. Add $1.45 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, packed.

	Ton lots	Carloads
96% Si, 2% Fe	20.10	18.00
97% Si, 1% Fe	20.60	18.50

Silicon Briquets

Contract price, cents per pound of briquet, bulk, delivered, 40% Si, 2 lb briquets.

Carloads, bulk	6.25
Ton lots	7.00

Electric Ferrosilicon

Contract price, cents per lb contained Si, lump, bulk, carloads, delivered.

25% Si	20.00	75% Si	13.80
50% Si	10.80	85% Si	15.50
65% Si	12.20	90.55% Si	17.60

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.65

Ferrovanadium

35-55% contract, basis, delivered, per pound, contained V.

Openhearth	$3.00-$3.15
Crucible	3.10- 3.25
High speed steel (Primos)	3.20- 3.35

The Clearing House

NEWS OF USED AND REBUILT MACHINERY

Western Outlook Brightens . . . San Francisco area used machinery salesmen totted up sales to mid-year last week and found things weren't half bad. Bargain hunters there are, to be sure, but extra volume at lower prices has boosted sales for many equal to or better than last year at the same time.

"We're actually making more profit now than a year ago at this time because we're moving more units than we were," one leading dealer said last week. "Of course the prices are down, but the total money volume is comparable. Business has steadied considerably from a few months ago and at least we can predict the future with a degree of certainty, so we know where we're going."

Business for Smaller Dealers . . . Business is also continuing healthy for many of the smaller, war-born dealers, although at the outset things didn't look too promising for the long haul. These are finding a good business in furnishing maintenance type units to larger corporations setting up shop in Northern California area. Top-notch credit standings of these companies is, of course, a welcome advantage. The bargains available in locally-procured used machinery is also a heavy deterrent to firms moving out machinery from major plants in other areas.

"People are in a buying frame of mind now," one dealer pointed out. "They have a lot more faith in the present administration now than a few months ago and are not so hesitant about going into new stuff. This gives us much easier ground to start on."

Start-up of small new shops has dropped off to a major extent, although mostly for seasonal reasons. Until arrival of hot weather it had continued at a good pace and all signs point to a resumption in Fall.

Imports Decline . . . Imported machine tool volume on the West Coast has dropped off considerably due to fast delivery by U. S. manufacturers and lack of price consciousness in buying new tools. More reliable local parts, warehousing and servicing has also helped U. S. manufacturers. Major appeal now in foreign tools is for highly specialized operations or extremely fine work where their reputation has been established.

Sales Trends in Used Machinery Industry

(Based on survey* of 96 used machinery dealers)

Sales of Used Machinery for Period:	Composite Sales	Pct 1953 Sales
July 1, 1953-Sept. 30, 1953	$6,683,937	22.79
Oct. 1, 1953-Dec. 31, 1953	6,469,241	22.05
Jan. 1, 1954-Mar. 31, 1954	5,410,695	18.44
		Pct Change From Previous Quarter
1st Quarter 1953	$8,423,343	
2nd Quarter 1953	7,760,411	—7.87
3rd Quarter 1953	6,683,937	—13.88
4th Quarter 1953	6,469,241	—3.21
1st Quarter 1954	5,410,695	—16.36

*Study was made by Machinery Dealers National Assn. Statistics cover only dealer-to-user sales of used equipment.